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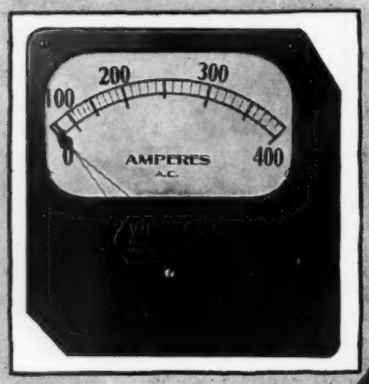

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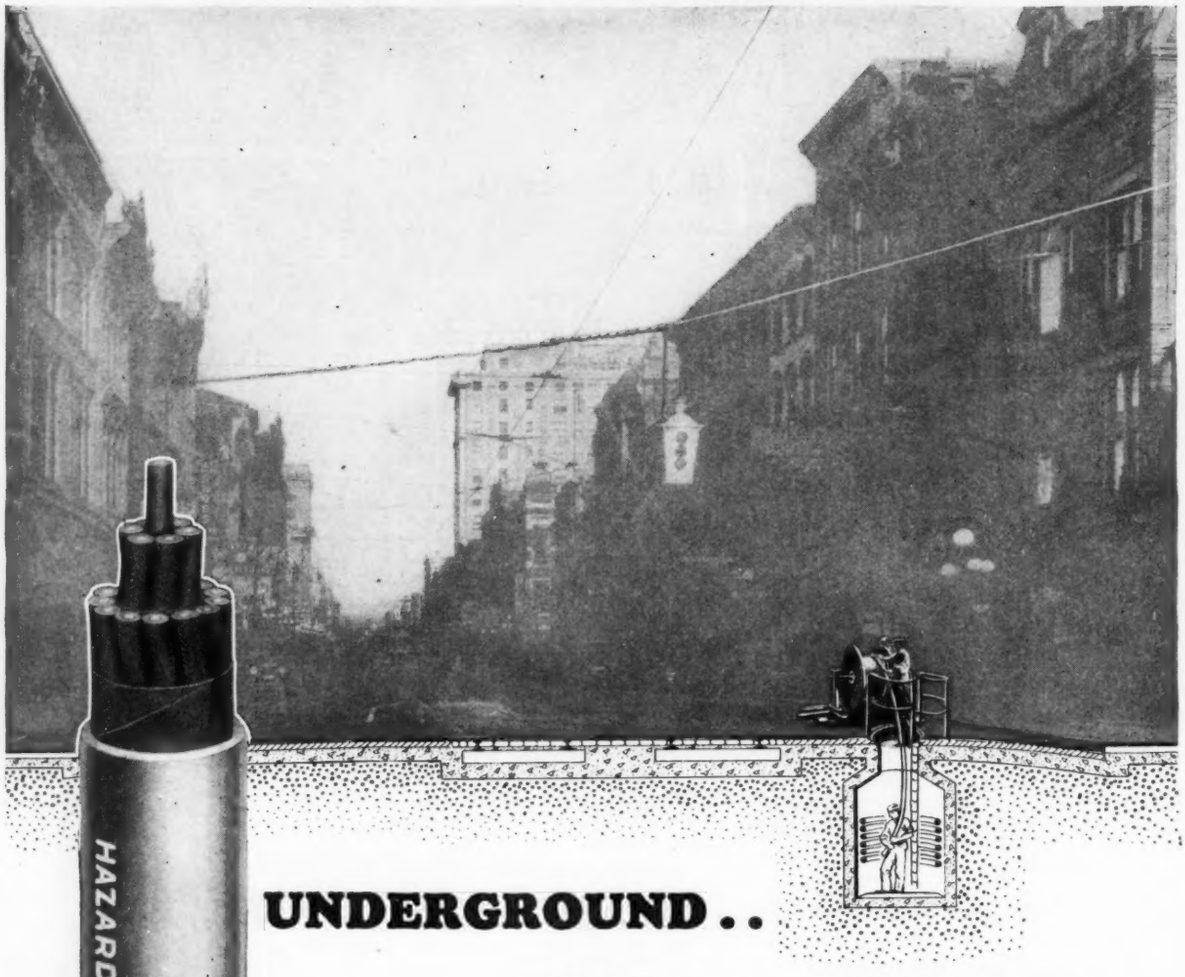

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Electrical World

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The Electric Bond & Share Case and Interstate Commerce

QUESTIONING the right of the Federal Trade Commission to inquire into the details of its private business and professional undertakings for its clients, claiming that they are competitive in their nature and involve the disclosure of costs and transactions wholly private and confidential and not relevant to the subject of the present inquiry, the Electric Bond & Share Company was hailed before the United States District Court for the Southern District of New York by the commission counsel on December 1, 1928. The court has now rendered its decision, sustaining in part the contention of the company holding that until particular documents become evidentiary the corporation is not obligated to place them before the commission. The court, in short, reiterates that the Federal Trade Commission has not the right to go on a "fishing expedition" in the hope of discovering transactions on which it has no preliminary information.

However, on the question of whether or not the company is engaged in interstate business no definite ruling was handed down. The court assumed the Electric Bond & Share Company to be thus engaged, but offered to lay the determination of that point before a master should the respondents wish to contest the propriety of the assumption. Thus one of the really important points at issue remains undecided. Is a holding company or an investment trust engaged in interstate commerce in such a sense that it is subject to present Federal Trade Commission investigation under the Senate resolution? The question is so important, in view of the multiplicity of holding companies and investment trusts, that a speedy and judicial adjudication of the matter should not long be deferred. On that point most of the future work of the Federal Trade Commission will depend.

* * * *

Allocation of Jurisdiction Over Standards

PROGRESS has been rapid and logical in the standardization program of this country. After many trials and tribulations, the American Standards Association emerged from industry as a comprehensive and authoritative group of industrial executives with a simple procedure for making standards. But parallel with this development was the growth of governmental standardization activities that culminated in the establishment of an industrial standardization department in the Bureau of Standards. Question then arose as to the relative jurisdictions of the two agencies and the delineation of the fields of activity in which they might engage.

These questions have now been settled, and the agreement is logical and workable. The government standardizing agency will deal largely with so-called commercial or temporary standards that may or may not be accepted as A.S.A. standards. And yet the governmental standardization agency can act as a sponsor under A.S.A. procedure in making standards. The agreement speaks well for those in charge of the negotiations. They showed a vision and breadth that have often been missing in past proceedings in the same field.

Now that the mechanisms are set up for making both commercial and A.S.A. standards, there is no excuse for dilatory action in their formulation. Industry as a whole or any industry group can get a standardization program under way easily and can get its standards made quickly. The success or failure of the movement rests upon those that need the standards and not upon the standardization agencies.

* * * *

Detroit Edison's Adventure in Range Manufacturing

FOR some time there has been great perturbation among the manufacturers of domestic electric ranges. It was known that the Detroit Edison Company had gone adventuring in the manufacture of ranges and was developing a new type of range to be low in price and quick in action beyond all precedent. It was the natural expectation that here was to be another case of a power company going out of its field to compete with its friends. The range people were particularly aggrieved because for twenty-odd years they had worked and pleaded with the utilities in the effort to awaken them to the value of range load. Now, having borne the heat and burden of the day, just as the range is winning general acceptance, this bellwether power company was apparently about to destroy the market by an attack upon price levels—and this at a time when the American people are spending lavishly for anything that they desire and when ranges, at present prices, can be readily placed in untold thousands of homes at the cost of a little energetic selling.

So it looked to the manufacturer. On another page appears a statement from an officer of the Detroit Edison Company, who is directing the range enterprise, which should considerably relieve the situation.

There is undoubtedly an important principle involved. For the power company cannot consistently preach specialization to its own customers and then build ranges on the side. It cannot expect the electrical manufac-

turing industry to set up vast resources for the service of the central station if it is to be repudiated whenever some utility believes that it can save or make some money if it starts a little factory of its own. And in truth the power company's right to do so has been openly challenged for the same reason that caused the government to bar the railroads from the coal business.

But the Detroit company raises another pertinent question of no less interest. It is the company's belief that domestic cooking ranges cost too much and operate too slowly. The manufacturers, the company's representatives feel, have been content to go too long without invoking the efficiencies of mass production. Therefore it seems to them quite in the public interest that somebody else should take the initiative and, if possible, develop a new type of range that will compete with the gas range in speed and sell to the utilities perhaps at somewhere about fifty dollars. This they have attempted to do. If they succeed, then, they believe, they will have shown the way and other manufacturers will at once produce this low-price range. As a result the market for electric cooking will have been immensely stimulated and expanded. This done, the Detroit Edison Company will retire from the field.

Now, whether or not it is the proper function of a public utility itself to pioneer new invention and development in the manufacturing field by these heroic measures is debatable. In this case, however, there is accumulating evidence that low-priced, quick-heat ranges will soon be placed upon the market by not one but several manufacturers as the apparent product of this radical action by the Detroit Edison Company. If from this somewhat unhappy incident constructive progress in the development of electric cooking is actually realized, principle or no principle, a valuable contribution will have been made. And when Detroit then folds its tent and steps out of the picture, that is the part that will be longest remembered.

* * * *

Samuel M. Kennedy

HIS MANY friends and admirers will be grieved to learn of the death of Samuel M. Kennedy, for many years connected with the Southern California Edison Company. Although originally associated with the sales end of the electric public utility business, in which he made an exceedingly creditable record, Mr. Kennedy's forte was public relations. Temperamentally, socially and from an educational background he was endowed liberally with qualifications for this work, and, fortunately for his company and for the industry, he gravitated in that direction when as yet the subject was virtually ignored by public utilities.

For a while Mr. Kennedy's voice was one crying in the wilderness. Never strong physically, he could not get around the country to spread his message as much as he would have liked to do; but he was a ready writer and what his body denied his brains supplied. Many articles from his pen found their way into the columns of the ELECTRICAL WORLD, and these were afterward gathered together into that admirable and readable little book of his called "Winning the Public." The first of its kind, its precepts are still applicable and worthy of serious consideration.

For the past five or more years Mr. Kennedy was confined to his home in a losing fight against death, but, notwithstanding his bodily pain, up to the very last he was always cheerful in bearing and conversation. His letters revealed the same optimism and sunny animation that, along with a delicately sensitive nature and the bearing of a true gentleman, were so conspicuous in his character. The industry loses in him one of its most talented exponents.

* * * *

Why Cells for Oil Circuit Breakers?

THERE was a time in the history of oil-circuit-breaker development when it was found advisable to provide masonry housings for these devices. Circuit breakers were then of rather weak construction, tanks were made of thin sheet metal, operating mechanisms were not very reliable, and breaker failures were common occurrences. Tanks leaked and spread oil all over the floor and breakers threw oil when they were opening. Eight-inch brick walls were handy for mounting the breakers and served at the same time as barriers to the oil, and four-inch brick walls were generally provided as cross-barriers, both serving their purpose well for the older types of breakers.

Busbar supports, too, were not any too strong in those days, fires caused by insulation failures were not infrequent, and it was quite natural to go a step further in the development of masonry structures and provide brick inclosures not only for the breakers but also for all bus work. Labor was not very high, and the masons used their time off from outdoor work on rainy days to build bus structures, carpenters to make forms and concrete men to make slabs. The time element was not very important, because power-house construction in those days was a comparatively slow-process. But even so, in many cases where oil-circuit-breaker explosions occurred, brick or even concrete cells likewise blew up, throwing bricks and concrete in all directions and causing more damage than if there had been no masonry cells.

None the less, masonry cells became a custom, and as is the case with many a custom, those who do not know its history and the original reason for it persist in observing it long after those who introduced and originally advocated the method have abandoned it. Thus today, in spite of the fact that all the large manufacturers of oil circuit breakers agree that there is no conceivable case where masonry construction would be necessary, its use is still common, even in very modern plants.

Indoor circuit breaker failures today are extremely infrequent; the tanks on large breakers are many times stronger than any brick wall, and if a breaker should ever make up its mind to explode, no masonry wall would ever stop it from doing so, while the damage which would be caused in a modern power house by flying bricks would be enormous. There is just as much sense in inclosing a modern breaker in a brick house as there would be in locking up an elephant in a reed cage. The brick walls would be as effective against an explosion as a picket-fence protection against a tank attack.

Bus supports, too, can be obtained now for any desired strength, and insulation failures are as infrequent as breaker failures. The item of labor involved in a masonry structure, with its small compartments, little bolts and inserts, is now quite high, and the installation

of equipment is delayed by the slow progress such masonry construction entails, because of the setting of concrete and other processes that take time. If cells are needed for switching equipment, factory-built or field-built steel cubicles are the only practical method for the modern plant. The difficulties involved in making the design free from heat-producing magnetizing circuits have now been solved by the use of copper or aluminum plates or non-magnetic steel at critical places. The steel units offer the further great advantage that they can be completed outside of the plant and can be ready for quick installation as soon as the floor is finished.

* * * *

Thomas E. Murray

LAST Sunday morning, in the quiet of his summer home, Thomas E. Murray, public utility executive and consulting engineer, yielded up the ghost. Rich in this world's goods, rich in progeny and rich also in accomplishment, Mr. Murray rounded out what his intimate friends knew to be a well-ordered life. There was no show or braggadocio about him throughout his allotted three score and ten years. He was a quiet and unassuming plodder—at first intent on getting the utility properties acquired by the late A. N. Brady in excellent working order. In those days Brady was a pioneer and the public utility business was struggling for its place in the sun. On Murray he relied to make his properties profitable. As the industry grew by leaps and bounds Thomas E. Murray grew with it. He became a prolific inventor and a consulting engineer who up to last year had power-plant installations aggregating more than two million kilowatts to his credit. Mr. Murray was intimately associated with the development of utilities in the New York metropolitan district and in addition contributed greatly to engineering progress through design and invention.

And yet, despite his many and varied activities, despite the great demands on his time, Mr. Murray's family life was exemplary and his church thought so highly of him that he was twice knighted. In private life his benefactions were quietly but liberally bestowed, and he knew and showed the great joy and satisfaction epitomized in the saying "It is more blessed to give than to receive."

* * * *

Who Rules—Lineman, Policeman or Interne?

NEWS of a day seldom fails to include some item which tells how electric light or telephone employees have resuscitated one of their fellow employees or some other unfortunate victim of drowning, asphyxiation or shock. An increasing number of these attempts are successful, and the electric service companies can take a pardonable pride in the fact that their trained employees are so often identified as the rescuers. The doctors, firemen and police are playing their parts with increasing effectiveness, but the very availability of several unco-ordinated groups who may be called upon for aid raises questions that have not been settled.

What makes the mixed situation serious is that too many of the narrations still carry the equivalent of the following: "On the arrival of the ambulance [or doctor, or police, or firemen] the resuscitation efforts of the linemen were interrupted. On arrival at the hospital the victim was declared dead."

Who does take precedence under the emergency conditions—the lineman who has been carefully trained in prone-pressure resuscitation or the policeman or fireman who is only partially competent with an inhalator apparatus? Shall the result of the doctor's stethoscope examination bring the abrupt cessation of the line gang's efforts, no matter how confident they may be of their ultimate success? And shall a competent rescue squad give way to the constituted authority of an interne who has never had instruction or experience with electric shock? The recent Brooklyn case of resuscitation from asphyxiation after thirty-eight and one-half hours makes one wonder how many lives have been sacrificed through conflict of authority and consequent interruption of the resuscitation efforts.

The accident prevention groups could render to the electrical industry a valuable service in digesting the various state laws allocating to the medical profession and the public safety authorities their relative precedences over volunteer groups, unofficial but with recognized skill in resuscitation. The executive would in the light of this survey be in a position to instruct his employees in their prerogatives as well as in the technique of resuscitation.

* * * *

The Transition Period Involves Problems

NO COMPANY which has an extensive transmission system involving lines of various vintage and equipment or which operates interconnected with other systems can attain the maximum use of its invested dollar unless intense and continuing study be devoted to providing system stability. Recognizing this fact, industry committees have been busy investigating the causes of instability and have suggested individual elements to which attention has to be given in the solution of some of the operating problems. This work has been a very valuable contribution to the industry and should be continued.

But as the committees and engineers that have gone into the problem will undoubtedly admit, there is need of a parallel study being carried on—one to determine the most effective order of applying these remedial measures. Of course, the most important lines, stations and intermediate apparatus affecting stability should be treated first. But if quick-operating, anti-hunting governors, quick-response excitation, reduction of transient reactance, and so forth, are merely applied here and there without co-ordination, the resulting situation may be as bad as the previous conditions, or even worse.

Modern electrical systems are comparable to a complex network of rubber bands with various degrees of elasticity carrying different weights at several points. When a disturbance occurs, this network is transformed into a complicated vibratory system. Every change in the electrical system changes the oscillations in each element of the network. What might be a very desirable change ultimately could easily produce severe disturbances in the transition period.

Co-operative study to determine the way to proceed through this transition period is therefore vitally important.

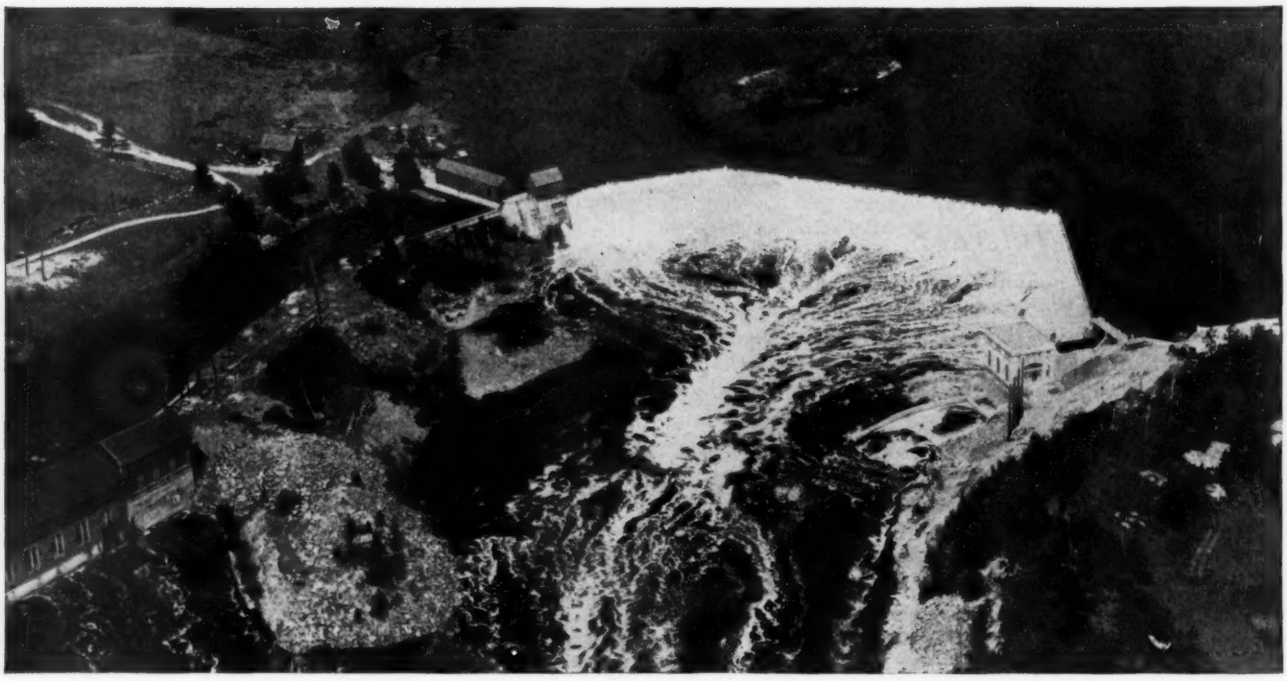
Gulf Island dam is 2,600 ft. long. The plant has three 9,000-hp. units. A pondage of 500,000,000 cu.ft. of flood water is created above this station

Fairchild Aerial Surveys, Inc., New York

River Yields 41,700 Hp. Within 1.5 Miles

HYDRAULIC resources have been effectively utilized by the Central Maine Power Company in a stretch of the Androscoggin River only 1.5 miles long in the vicinity of Lewiston, Me. The completion of the 27,000-hp. Gulf Island station in the fall of 1926 (52 ft. operating head) resulted in the discharge of more water than the 9,252-hp. Deer Rips station below could handle. Instead of revamping Deer Rips it was found more economical to build a 5,500-hp. plant (Androscoggin No. 3) on the opposite shore, operating it by remote control from the oldest of these three stations of the Central Maine Power Company.

Deep Rips plant and canal at left, dam in center and new No. 3 station at right, utilizing discharge water from Gulf Island plant



Substation Grounding

Fundamentals of grounding practice. Grid system used by the Southern California Edison Company at Lighthipe substation

By F. H. MAYER

Department of Engineering Design, Southern California Edison Company, Los Angeles, Calif.

FUNDAMENTAL considerations to be satisfied in any grounding system as set forth in the standards of the Southern California Edison Company are as follows:

1. An accidentally grounded portion of a system must be supplied with a return path of such low resistance that the ground current will always follow this path rather than some other, such as domestic water pipes, etc.

2. The potential of any grounded piece of apparatus or structure must not be allowed to rise appreciably above that of the surface upon which a person may be standing at a time when it is possible to touch the apparatus or structure.

3. The conductivity of the return circuit must be sufficiently high to prevent any appreciable potential gradient along its length.

Where the ground return circuit involved is between pieces of apparatus in the same station, conditions (1), (2) and (3) are satisfied by providing a copper return circuit of approximately one-quarter the cross-section of the phase leads and installed in close proximity to the phase leads themselves.

A synchronous condenser with its bank of transformers, switches, etc., is an illustration of the aforementioned type. In this case a copper return circuit

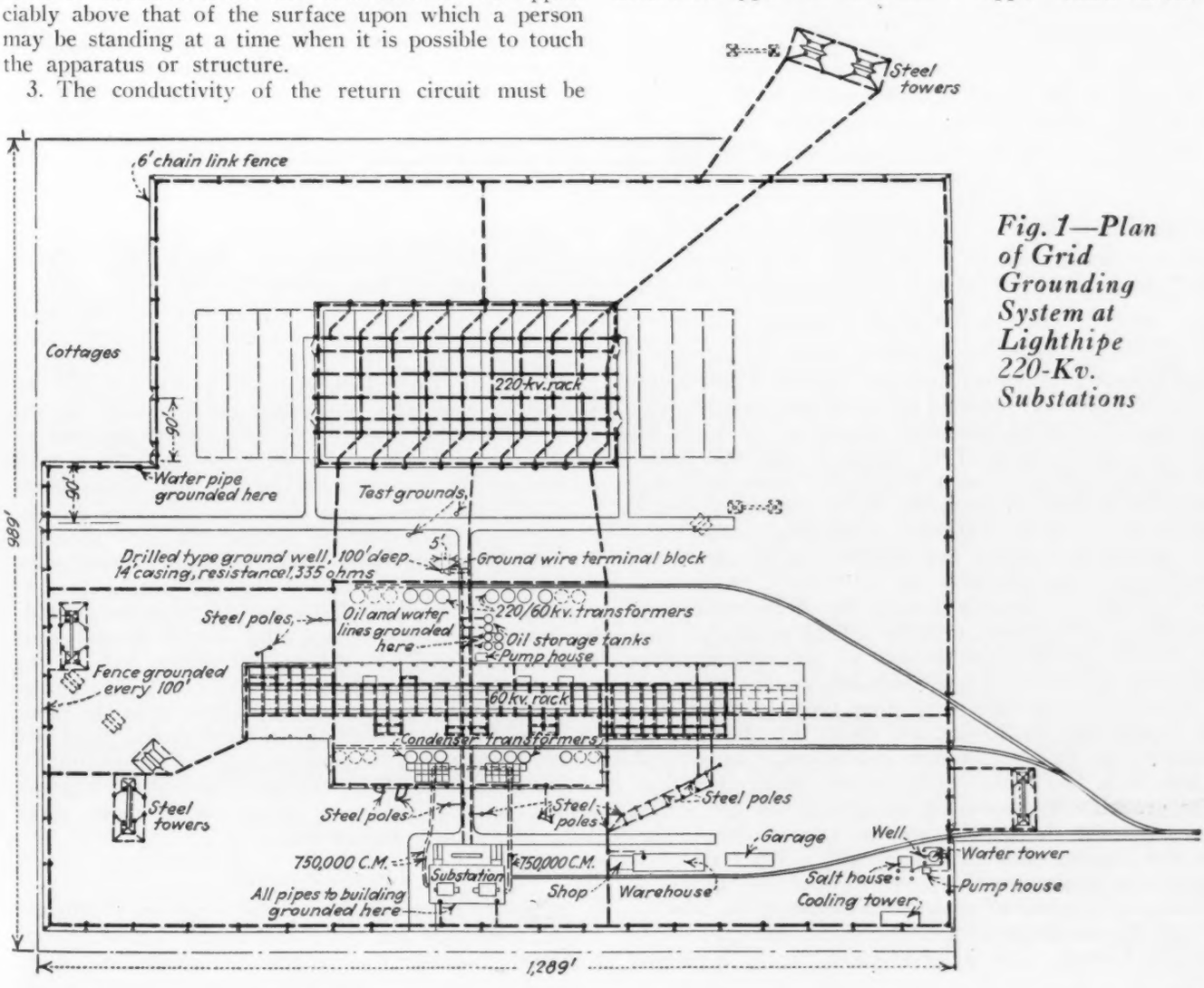


Fig. 1—Plan of Grid Grounding System at Lighthipe 220-Kv. Substations

should be run from the condenser neutral to the neutral of its transformer bank, with taps to condenser frame, transformer cases, circuit breaker tanks and frames, disconnecting switch bases, insulator bases, etc.

Where the ground return circuit is to some point remote from the station the earth must necessarily be used as a return path. There is no way of controlling the earth contact resistance at the point of trouble, but it should be made as low as possible at the station by means of (a) a ground well which is connected through copper cables to all apparatus to be grounded or (b) a buried copper network supplemented by driven ground rods and connected by copper cables to all grounded apparatus. Details of the application of methods (a) and (b) are given in subsequent paragraphs.

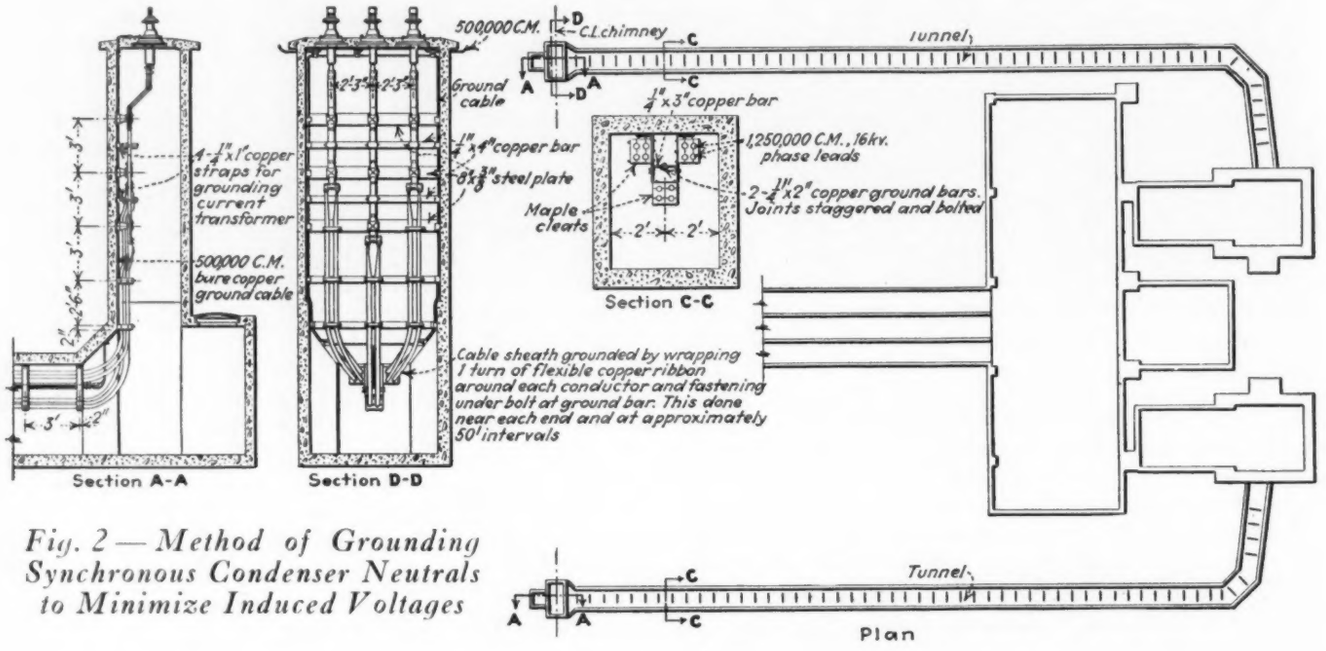

500,000 C.M.
C.L. chimney
Tunnel
Ground cable
1" x 4" copper bar
8" x 3" steel plate
4-1" x 1" copper straps for grounding current transformer
500,000 C.M. bare copper ground cable
1" x 3" copper bar
1,250,000 C.M., 16 kv. phase leads
2-1" x 2" copper ground bars. Joints staggered and bolted
Maple cleats
Section C-C
Cable sheath grounded by wrapping 1 turn of flexible copper ribbon around each conductor and fastening under bolt at ground bar. This done near each end and at approximately 50' intervals
Section A-A
Section D-D
Tunnel
Plan

Fig. 2 — Method of Grounding Synchronous Condenser Neutrals to Minimize Induced Voltages

Grounding at Lighthipe

The main principles embodied in the grounding of substations and power houses enunciated above are practically all incorporated in the Lighthipe grounding system. Lighthipe substation is one of the most important on the system of the Southern California Edison Company and serves as a distribution point for power received at 220 kv. from the Big Creek hydro-electric plants and the new 90,000-kw. Long Beach steam plant. At present the station has 150,000 kva. in 220/66-kv. transformer capacity and two 50,000-kva. synchronous condensers. Ultimately double this transformer and synchronous condenser capacity will be installed. Thus it will be seen that the problem of providing adequate grounds was one of considerable importance.

At this station there were three types of grounds to be considered, the 220-kv. and 66-kv. neutrals and the neutrals of the synchronous condensers. In general, there were two things to be accomplished, control of the ground current caused by a fault on the station property and the ground current from faults foreign to the station, such as a line fault. The former is cared for by the use of a network or a grid, as shown in Fig. 1, in which all equipment, including the neutrals of all the transformers and rotating machinery, is thoroughly bonded. The latter is cared for by a suitable bond to the earth, such as is possible through the use of driven electrodes or by an electrode sunk in a deep-drilled well.

It should be borne in mind that on any grounded system where the connections on the secondary side of the transformers are such as to permit equalizing current to flow a line-to-ground fault current will seek the neutral of the transformers.. This fact, for safety reasons, makes it highly important to provide a very low resistance path from all parts of the substation to the neutral of the transformers and rotating machinery. It may be possible to ground equipment to separate ground electrodes with the resistance sufficiently low to keep the potential gradient within safe values, but in practice it is not economically feasible.

On the station property there are usually water pipes, spur tracks, conduits, etc., all of which form a comparatively low resistance path, and if the resistance is high through the grounding system this network of pipes will serve as a conductor for any stray current that may develop. The difficulties usually experienced in relying on the pipe and conduits to carry the ground current are that many times the pipe is not continuous and as a result some very high potentials may develop over a very short distance. Many times this potential is sufficiently high to break down the insulation on control cables and instrument boards, causing serious damage. For example, if the resistance of the grounding system was one ohm, a value that is usually considered very good for ground electrodes, and it was possible to get a short-circuit current of 10,000 amp. on a 66-kv. system, the potential gradient from the point of fault to the neutral would be 10,000 volts. The difficulties that might be expected under such conditions are quite obvious. If all the equipment is tied together with a suitable conductor, as mentioned above, these dangerous voltages cannot exist.

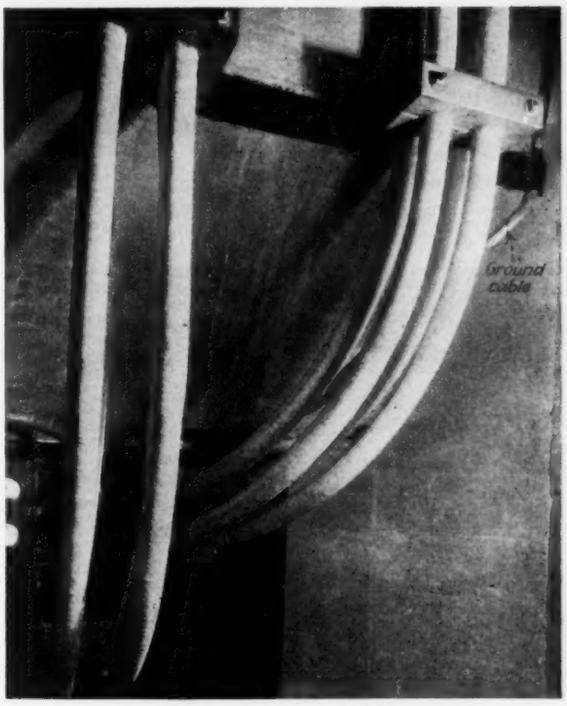
Grid System

It has been the practice of the Southern California Edison Company for some time to use a grid system, this grid consisting of copper cable buried about 6 in.

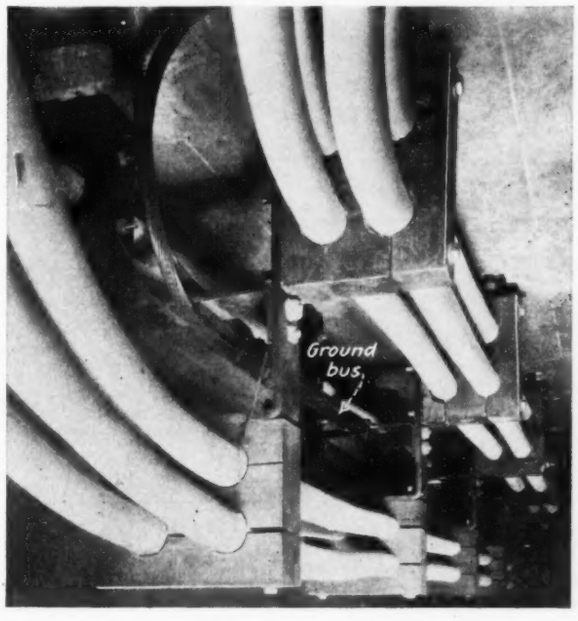
in the ground and securely bonded to each piece of equipment and then grounded to an electrode, which may consist of numerous "Copperweld" ground rods or a single drilled well with a suitable electrode at the bottom of the well. In all cases where there are lightning arresters the "Copperweld" rod is used for the electrode, but in addition to this the lightning arrester ground is tied into the network. If the grid system is used, so far as the control of fault current is concerned on the station property, there is no need for a ground electrode, but since the transformers at a particular station are very likely to be parallel with other transformers located at remote points it is necessary to have some means of providing and receiving ground current and therefore ground electrodes are necessary. Also the ground electrodes serve to pick up ground current caused by a fault remote from the stations.

The resistance offered to the fault current remote from the stations is beyond control. As a matter of fact, the higher the resistance the better, so long as there is sufficient current flow to operate the oil circuit breaker relays. This is not true at the station, for if the resistance of the ground electrode is high there is danger of the ground current returning to the neutral through the water system, telephone leads, railroad tracks, etc. Current returning over the water system or through the well used for water supply is not so serious providing the piping is all thoroughly bonded to the station grounding system, thus avoiding any gaps on the station property, where differences of potentials would be very dangerous both to life and property.

Referring again to the grid system of grounding, it might be well to mention that all Edison installations, regardless of voltage and capacity, have the steel and equipment grounded to a network of copper. The size of the conductors used in all cases is determined by the maximum short-circuit current possible at the time of a fault and the potential gradient that is to be tolerated. The Southern California Edison Company has arbitrarily set a tolerance of 30 to 50 volts as being suitable. This means that at a station where the possible short-circuit current is 10,000 amp. and the main switching rack is 63 ft. away from the transformers, one No. 4/0 copper cable is sufficient to keep potential gradients within the tolerable limit.



Continuation of Ground Cables into Vertical Section of Tunnel at Transformer End



Condenser Lead and Ground Bus in Conductor Tunnel

The ground bus is located in the geometric center of the phase group. The two 750,000-circ.mil cables in the end of the ground busbar are tied to the ends of the steel insert plates supporting the cable cleats in the vertical section of the tunnel.

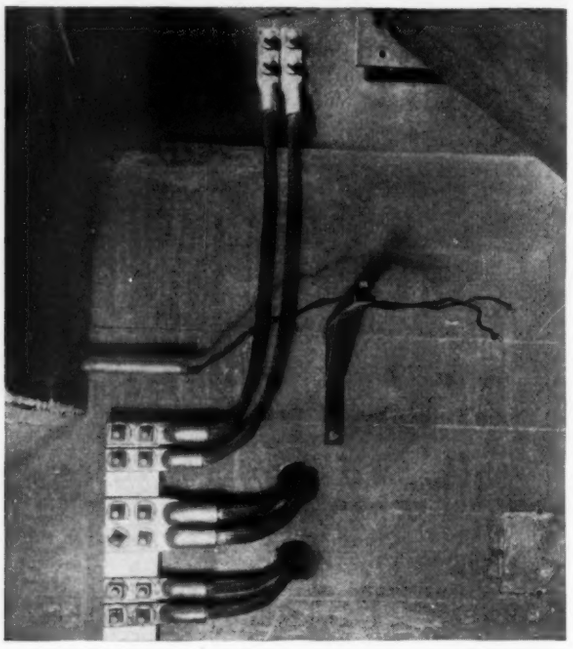
The general grounding plan and extensiveness of the network system as used at Lighthipe substation is shown in Fig. 1. The grid or network system when applied to high current capacities with comparatively low-voltage equipment, such as are found when dealing with a 12,500-volt, 50,000-kva. condenser, offers quite an interesting problem.

Carrying out the same general idea of having metallic conductors at every point where there is a possibility of a line to ground fault, it is necessary to run one or more conductors parallel to the main leads feeding the generator or condenser, as the case may be, and bond the base of the insulators. The fact that this grounding conductor is near and parallel to the main leads introduces the problem of caring for induced voltages in the ground lead. It is important that one of two things be done, either the conductor must be placed so that the ground leads are in zero magnetic field or connections of the ground lead so made that the voltage induced can dissipate itself without permitting it to reach unduly high values.

Influence of Physical Design

The physical design of the station very often determines what can be done. At Lighthipe substation the transformers and the starting and running breakers are outside and located quite a distance from the condensers. This made possible arranging the three phases of the condenser leads in an equilateral triangle. The

ground conductor in this case consists of two copper conductors, one being located in the center of the triangle and the other outside and remote from the main leads. Near the transformer end of the condenser the cable is housed in a chimney-like structure. This structure carries the condenser leads to the upper part of the transformer and switching rack, the two ground leads being so arranged that there is one ground conductor



Terminal Plate Showing Connections Between Condenser Frame and Ground Bus in Conductor Tunnel

The two 750,000-circ.mil cables on top connect to the condenser bedplate. The two 1,000,000-circ.mil cables in the center are tied to the ground busbar which follows the main phase cables in the tunnel. The two 750,000-circ.mil cables at the bottom tie to the condenser transformer neutral busbar near the transformers.

on each side of the two outside phase leads and in the same plane. The two ground conductors are a continuation of those in and near the tunnel and are bonded to the steel insert plates. These plates serve not only as a convenient means of grounding the base of the insulators but also serve to break up the voltage induced on the ground leads.

It will be noted that the only ground to the condenser frame and neutral is the two conductors above mentioned. It is true that these conductors do indirectly tie into the ground well, but so far as caring for fault currents is concerned on the condenser leads and condenser transformer secondaries they serve no purpose. The condenser bus has no feeders radiating remote from the station and therefore the copper network is sufficient without the necessity of ground electrode.

Since the short-circuit values are less on the 66-kv. and 220-kv. systems than on the 12,500-volt condenser circuit the leads to the ground well can be made less in cross-section than on the condenser side of the transformer bank.

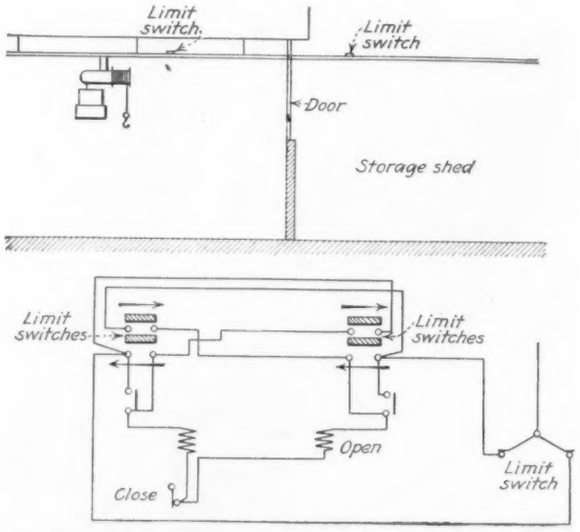
At the time Laguna Bell substation, another important 220-kv. receiving station, was built in 1923 it was decided that two drilled wells were necessary to keep the station potential down to safe values at the time of a fault. At that time little was known about grounding requirements of high-voltage, high-capacity stations and every precaution was taken to make the station safe both to life and equipment. Experience later indicated that one deep-drilled well was sufficient, and as a result only one ground well was installed at Lighthipe. This well consists of a 14-in. steel casing 100 ft. deep. The measured resistance of the well is 1.335 ohms. The station has been in operation for approximately two years and there has been no indication that the ground well resistance is too high.

Limit Switch Applied to Industrial Problems

By A. F. Bowers
General Electric Company, Philadelphia, Pa.

TO PERMIT the passage of a monorail hoist and its load, the door of an industrial building had to be opened at the approach of the crane and closed behind it. A standard magnetic switch and four limit switches were used. The limit switches are mounted along the track, two on each side of the door, and energize the opening or closing contactors as the hoist approaches or leaves either side. The doors are stopped in each direction of travel by a limit switch built in the door operator, furnished by the Cyco Door Operator Company.

A somewhat similar application involved a cylinder polishing machine in a textile plant. The etched-copper printing cylinder revolved in a machine and the polishing head traveled back and forth the entire length of the cylinder. It was desired to make the operation entirely automatic. A magnetic switch was used, together with four limit switches and a snap switch. The limit switches



Contact for Opening and Closing Door on Passage of Crane

were mounted at each end of travel of the polishing head, one at each end to make a circuit and the other to break a circuit. By properly placing the limit switches it was possible to allow the head to drift until the motor head almost stopped. This prevented plugging at each end of travel.

Surge Protection and Ground Resistance

By A. H. Kidder

Assistant Engineer of System Planning, Philadelphia Electric Company

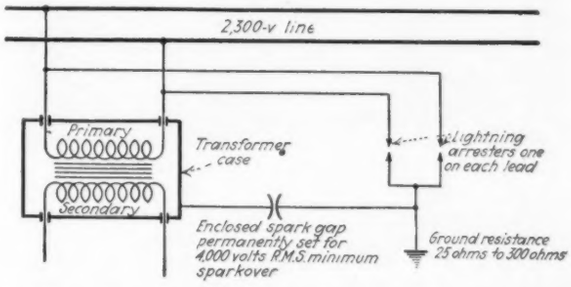
CAREFUL analysis of distribution transformer outages in Philadelphia indicated that 75 per cent of all fuse failures during the electric storms of 1927 were apparently due to a power arc forming between primary and case or between primary leads and holding until the fuses blew. Generally service was restored after replacing the fuses. Occasionally leads were burned off either inside or outside the transformer case and very seldom was the transformer damaged beyond repair.

The installation of lightning arresters on small distribution transformers in Philadelphia has given fair but not the desired results in improved service. Troubles during electric storms in exposed and previously unprotected areas were reduced approximately 70 per cent in the years following the installation of lightning arresters. Practically the maximum improvement in service was reached in this city when between 30 per cent and 50 per cent of the transformers were protected.

The average untreated ground resistance was approximately 150 ohms. An improvement in results might have been effected by salt treatment. This expedient, however, is expensive, particularly when applied to the comparatively great number of distribution transformers. Frequent retreating is necessary for continued effectiveness.

In order for a power arc to form between conductors, there must be an initial flashover. Induced potential differences between the parallel conductors on a given distribution circuit should be essentially zero. Flashover, therefore, must occur between the leads and the transformer case. In this manner an ionized path is established by which the power arc may follow from lead to case, thence from case to the leads of opposite polarity.

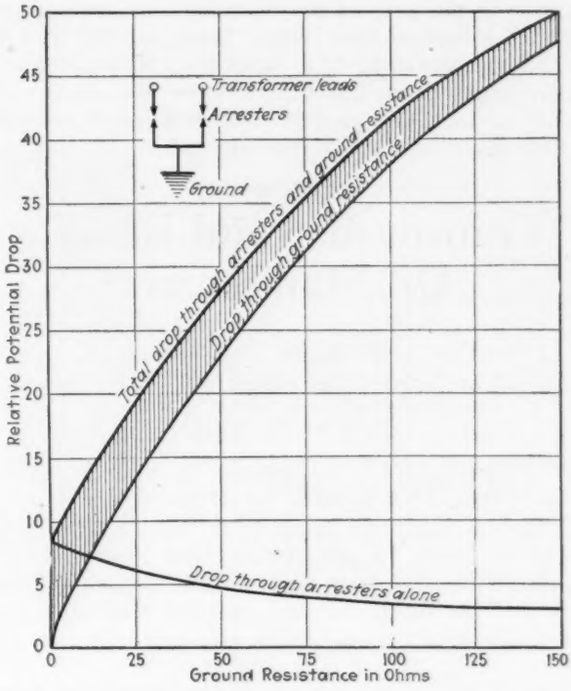
In order to prevent the flashover between leads and transformer case, it is necessary to arrange that the potential of the case be held very nearly equal to that of


2,300-v line
Primary
Transformer case
Secondary
Lightning arresters one on each lead
Enclosed spark gap permanently set for 4,000 volts R.M.S. minimum sparkover
Ground resistance 25 ohms to 300 ohms

2,300-Volt Lightning Arrester Installation with Auxiliary Transformer Case Connection

the leads. This is accomplished in a certain degree by the installation of lightning arresters according to general practice and is thought to be aided by low ground resistance. The initially bound charge on an ungrounded transformer case, when released, results in a potential nearly equal to that of the line and must discharge through the resistance of the pole. If the pole resistance be very high and the lightning arrester ground resistance very low, it is quite likely that the leads may be at sufficiently lower potential during lightning arrester discharge to result in flashover from case to leads. Low lightning arrester ground resistance may be a service hazard under such conditions. Ground resistances vary widely and pole resistance is far more difficult to deal with.

On the other hand, lightning arresters are highly



Relative Potentials in a Typical Lightning Arrester Circuit

developed. Their discharge characteristics are fairly uniform and offer an opportunity for excellent protection. It is possible to limit the potential between primary leads and case to the potential drop through the arresters during discharge by grounding the transformer case to the lightning arrester ground lead. This value, for practically any standard type of lightning arrester, is generally below that which will result in transformer flashover and may be a very small proportion of the total potential drop through the arresters and ground resistance. To overcome the hazard to linemen of solidly grounding the transformer cases, a suitably designed spark gap may be installed in a ground connection to the case, so as to leave the case ungrounded under all normal conditions, but permit definitely charging or discharging the case under electric storm conditions to a potential differing from that of the primary leads only by the drop through the arresters.

Early in 1928 such transformer case grounding connections, including an inclosed weatherproof spark gap designed and tested for 4,000 volts minimum flashover, were installed at random on approximately every fifth protected transformer installation in a particularly exposed trial area. This area comprised over 25 per cent of the total area of Philadelphia and is served by 10 per cent of the total number of distribution transformer installations in the city. In 1928 the transformer fuse blowings per transformer installation during electric

storms were 72 per cent lower on installations where the spark gap transformer case grounding connection was used. This improvement was so encouraging that the use of the spark gap connection is being extended to 600 additional exposed transformer locations on the Philadelphia Electric Company and Philadelphia Suburban Counties Gas & Electric Company systems for further observation in 1929.

This increased effectiveness of the lightning protective equipment has been accomplished at a 10 per cent average increase in the cost of the lightning arrester equipment for each protected transformer bank and has been done without treating grounds to lower their natural resistance, which ranges from 25 ohms to over 300 ohms. As a matter of fact, low ground resistance is not necessarily as desirable where spark gaps are used.

Transformer and Breaker Oil Maintenance

By W. K. Danvers

Superintendent Maintenance and Reclamation, Oklahoma Gas & Electric Company, Oklahoma City, Okla.

IN PERIODICAL inspections of transformers, oil levels should be checked and oil tested. If it is found that the oil has been sludging it will be necessary, at certain intervals, to pull the coil and thoroughly wash out all oil ducts through the winding, the surface of the coils and the inside of the case in order to maintain proper operating temperatures and insulation resistance because, after oil has once started sludging, very little of the accumulation on the heat-conducting surfaces can be removed by filtering or reconditioning the oil without removing the core.

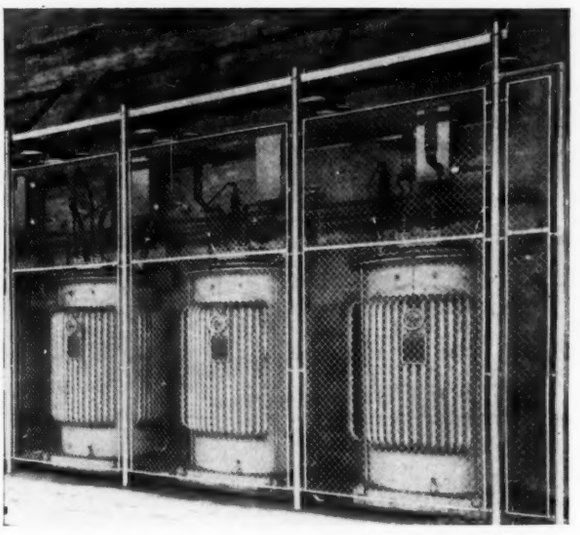
Under usual conditions oil and water do not mix, but they seem to take a special delight in doing so in a transformer or oil switch. Good, clean, dry oil when tested in a standard cup will have a dielectric strength of from 30 to 35 kv., and yet two parts of water to one hundred thousand parts of the average transformer oil will lower the dielectric strength to a point below 16.5 kv., which is the absolute minimum and below which no transformer oil should be used without being reconditioned.

Sludge in transformer oil is formed by oxidation with entrapped air and by the reaction of acids released by the decomposition of the oil with certain metals in the transformer. The first type of sludge does not seem to affect the resistance of either the transformer insulation or the oil; it tends only to stop circulation by filling up the oil ducts and preventing the proper dissipation of heat through deposition on the coils and case of the transformer. The second type of sludge, however, by its active affinity for moisture, will greatly affect the insulation resistance of both the transformer insulation and the oil itself.

In drawing off an oil sample for test, care must be taken that the valves from which the sample is to be drawn are thoroughly flushed out, not only to remove any moisture or dirt that might be present in themselves but also to be sure that the sample so taken is a representative sample and is not oil that had been trapped in the valve body or fittings. As the oil in the bottom of the transformer or switch tank usually contains more moisture and other impurities than the oil in the top it is necessary to take samples from both locations in order to determine the average condition. Testing oil for dielectric strength is easily performed with standard apparatus available from manufacturers.

There are several types of equipment on the market for reconditioning transformer and switch oil. For transformers the oil can usually be clarified and brought up to standard dielectric strength by the use of a centrifugal type separator. This separator is very satisfactory for removing moisture, sludge and the heavier impurities, but it is not capable of removing the finely divided carbon in suspension in switch oil. This colloidal carbon, as it is termed, is formed by the burning of the oil at the switch contact, and it cannot be removed by centrifugal action as it has the same specific gravity as the oil. The pressure filter, or blotter type of separator, is more successful in reclaiming switch oil, but is much slower and more expensive to operate. It is, however, not entirely satisfactory and about the only way that switch oil can be entirely reconditioned is by certain chemical treatments in conjunction with a filter of Fuller's earth, and as the equipment necessary for this treatment is not portable and is rather expensive it is doubtful that any other than the very large operating companies can economically afford to invest in equipment of this type, considering the amount of switch oil that can be reclaimed.

Neutral for Delta Circuit



THE 12-kv. system of the Commonwealth Edison Company, Chicago, is delta connected and thus has no neutral. In order to establish a local neutral in the Washington Park bulk supply substation, so that the current overload relays will function if a ground fault occurs, use is made of the grounding transformers shown here. The transformers are connected in star, one bank to each of the 12-kv. station buses, from which the outgoing feeders are taken off. The center of the star is grounded and the secondaries of the three transformers are closed on each other in series. The current rating for this particular installation is 667 amp. per phase for four minutes, 2,000 amp. total to any ground fault, sufficient current and time to permit the overload relays to operate. Tests and actual performance have demonstrated the satisfactory functioning of this scheme.

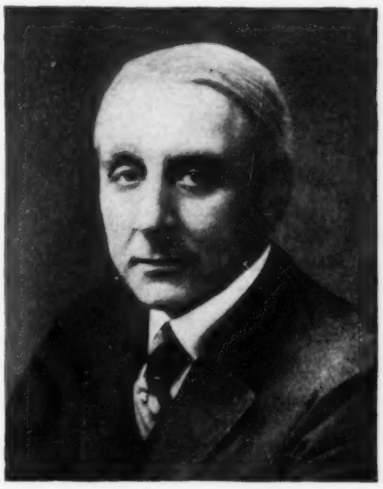
A Misunderstood Industry

*Must Continue to Explain Practices**

By MARTIN INSULL
President Middle West Utilities Company

"IN DEVISING and applying the various means of cultivating well-informed public opinion, you not only broaden your own knowledge of the industry but you are at the same time educating the army of men and women employees to a broader and better service to the public, which in itself tends to intensify that favorable public opinion upon which the success of the industry so largely depends.

"We all agree that good service is the prime requisite. But service must not stop at the lamp socket or the motor. It must, in addition, carry with it a well-informed personnel that can intelligently answer the inquiries of the public—a personnel trained to understand that their gratuitous personal service to the customer is just as important to the success of the industry as the operating efficiency which it is the customer's right to expect. Not just a silent utility service, but a human service. Not a 'public be damned' service, but a 'public be pleased' service. There is no maudlin sentimentality about this. It is just good business. We are in business to succeed, not to fail. We cannot succeed unless we have the good will of our customers, the public, because the investor on whom we depend for capital with which to carry on our business is not going to invest in a business to which the public is antagonistic.



Martin Insull

"It was certainly evident from the report of the Investment Bankers' Association ten years ago that public relations work was necessary, and as the public, in the natural course of events, is always changing, public relations work is and will always be necessary. We must never stop informing the public and educating ourselves and our employees in the fundamentals of our industry.

NEWSPAPERS FEATURE FICTITIOUS STRUGGLE

"As to how successful our work has been, the effect on the public mind of the investigation now being carried on by the Federal Trade Commission is some indication. With the exception of the sensational press and in spite of their exaggerations of the occasional mistakes that have been uncovered and their disregard of all the great constructive work of the industry, very little interest has been displayed by the public at large in the investigation. Certainly the investors' confidence in the industry or its management has in no way been shaken. We cannot assume that this would have been the case had it not been for the informational work of this important section.

"How much criticism of faulty service do we hear? How much complaint or dissatisfaction at that all-important point of contact between the operating company and the public? How many instances do you know of complaints about rates by the people actually paying those rates? I see little sign of any quarrel in these relationships. What I do see is a fictitious struggle between a mythical 'consumer' and an abstract 'power trust' which does not exist.

"This is a strange and paradoxical situation but it must be dealt with. To a large extent it is due to this—the public fails to connect up the local company, which it regards highly, with this somewhat mysterious electric industry that it reads about in the papers. Cannot we show them the simple fact that the electric industry as a national institution is simply the sum of all the neighborly people who furnish their electric service locally? Its bigness is simply the bigness of our nation. If people keep that in mind they will see no evil in the mere bigness of our business—they will realize that it must be big to do the big job it is responsible for.

"A great deal of attention has been given by the investigators to the industry's opposition to governmental ownership and its informational work along that line. Why should not an industry responsible for so much of the money of the saving and thrifty people of the country defend that investment to the best of its ability against attacks by proponents of the government entering the business? Is there any other position that the men of the industry on whom the public rely for the safety of their investment could take, feeling that every effort toward government ownership and operation points toward a general scheme for the nationalization of the whole electric light and power industry?

ALL BUSINESS AFFECTED BY GOVERNMENT INTRUSION

"It is certainly within the rights of the industry to assert its belief that government should do only such things as the people cannot do for themselves; that government has no business going into business, and that the continual encroachment of government in all lines of business will ultimately undermine this country's wonderful experiment in democracy. The very newspapers that

**Excerpts from address before N.E.L.A. Public Relations Section.*

criticise the electric light and power industry would be the first to complain loudly if the government went into the newspaper business, or even attempted to regulate its service and its profits. The unfortunate thing is that business as a whole stands idly by while the government goes into the other fellow's business, overlooking that theirs may be the next attacked. Has not the time arrived when all business should combine to make it thoroughly understood in this country that the proper function of government is to govern business, not engage in it, and that industry has the right to protect itself against such a course by any honest and truthful means that it can use? Should the leaders of industry be condemned for their efforts to protect from such attacks the capital for which they are trustees?

"The electric light and power industry should be opposed to government ownership and operation not only of its own but of all other industries, and it has the right and it is its duty to take that position before the people in every legitimate way. This country has been built up on private initiative, ownership and operation until it has reached its present pre-eminent position as an industrial nation. Should it now, while other nations are turning toward its method of development, reverse itself and embrace government ownership and operation of industry, which they, so far as they are able, are discarding?

Only Facts Given to Schools

"Every effort should be made to efface from the public mind any misunderstanding with regard to the industry's activities in the schools and colleges. Our educational efforts in the schools have been purely factual and have dealt only with the physical and economic aspects of our business. They have been directed toward supplying the coming generation of business men and women with a better understanding of the public utility business. Our business differs from the businesses with which most people are familiar. It has a very slow capital turnover—once in five to six years—while many others turn their capital five or six times a year. For this reason it cannot supply increased facilities out of earnings and is, therefore, constantly in the market for its new money. It is a natural monopoly because the duplication of service would mean an economic waste of large proportions. People are naturally opposed to monopolies, and especially so if they do not understand that there are real economic reasons therefor. Toward the end that there may be future utility leaders educated in some of the fundamentals of the business, we have fostered courses in public utility management, economics and financing in some of the schools of commerce of our universities. As these great services must be carried on, surely this is in the public interest.

"Undoubtedly in a national informational campaign on any subject some details unfortunately will creep in that can be criticised, and especially at a time when those opposed to it are looking for things to criticise. But there is nothing wrong with the fundamentals of the utility industry's effort to inform the public regarding its important position in the social and business life of the nation. In fact, one of the great dangers today is that certain lines of business are outgrowing public understanding because of their size alone. Such businesses can offset this only by using every means in their power to bring about a correct public understanding. It is this that the public relations section should do for the electric light and power industry.

"Business always needs public confidence, and this confidence can only be obtained if business men themselves inform the public about all phases of their businesses. What we need more than anything else are campaigns of honest, informative publicity by businesses, so that the man in the street will understand that what is being done is for the greatest good of the greatest number. If that is not what any business is doing then it should be out of business, and it can test itself most readily by frank and open publicity."

Transformer Impedances Reduced to Rated Values

By Rudolph C. Ericson

Northern Indiana Public Service Company, Hammond, Ind.

IT IS standard practice to state the per cent impedance of transformers at 75 deg. C. Since it is not usually practicable to maintain this temperature in testing, it is necessary, for comparison of test figures with manufacturers' ratings, to correct the results to the stated temperature. In the calculations for this correction there is a factor which is constant for a definite test temperature and power factor. This factor is the radical in the equation,

$$V = Ir \sqrt{\left(1 + \frac{75 - t}{234.5 + t}\right)^2 + \frac{1 - a^2}{a^2}}$$

in which V is the impedance volts drop at 75 deg. C., I is the full load current of the transformer, r is the total (equivalent) resistance of the transformer at the test temperature t, and a is the power factor during the test. With the constant fixed by the values of t and a, the equation becomes

$$V = IrK$$

It may also be shown that

$$V = \frac{WK}{I}$$

in which W is the watts input to the transformer when the impedance test is taken with full load current.

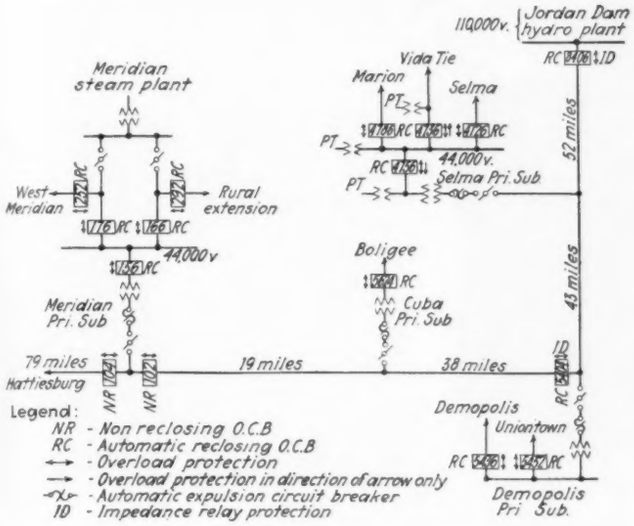
The values of K for corresponding values of test temperatures and power factors have been calculated to the following table. On large station transformers the values of a are considerably below 0.1 and the temperature impedance correction is not material. The table is applicable to the smaller sizes such as are used in distribution work. In order to avoid the labor and chance of error in interpolating in the table, since the a values do not lie in a straight line, it is convenient when much of this sort of work is to be done to set up the table in a family of curves.

Values of "K" for Comparing Impedances at Different Temperatures and Power Factors

Degrees Centigrade	0	10	20	30	40
Value of a					
0.1	10.03	10.03	10.02	10.02	10.01
0.2	5.07	5.06	5.05	5.03	5.02
0.3	3.44	3.42	3.40	3.39	3.37
0.4	2.64	2.62	2.60	2.57	2.55
0.5	2.17	2.14	2.12	2.09	2.07
0.6	1.87	1.84	1.80	1.78	1.74
0.7	1.67	1.63	1.59	1.55	1.52
0.8	1.52	1.47	1.43	1.39	1.35

Automatic Reclosing of High-Voltage Circuits

A VERY good example of the application of automatic reclosing oil breakers to a very long 110-kv. transmission line is afforded on the Jordan Dam-Hattiesburg line. According to E. W. Robinson and S. J. Sturgeon of the Alabama Power Company, who spoke



110-Kv. Line on Which Automatic Reclosing Breakers Are Applied

recently before the A.I.E.E. meeting of the Southwest district, this line is 231 miles in length and has four 110-kv. oil circuit breakers in series, two of which are automatic reclosing. It serves a total of seven primary substations, but only four of these are of interest from the standpoint of the application of reclosing oil breakers to 110-kv. lines.

The Jordan Dam hydro-electric plant is the normal source of supply. Breaker 8406 at Jordan Dam is automatic reclosing and is equipped with impedance relays which depend on both the line current and the voltage drop in the preceding section of line for their operation. This breaker is also equipped with overload relays for back-up protection.

The Selma primary substation includes four 44-kv. automatic reclosing breakers which lock out after their second reclosure (third opening). This station has a source of power from Vida, hence the transformer bank pressure 4756 is equipped with reverse power protection, in addition to overload protection. The normal source of power is from the 110-kv. line, and the automatic reclosing breaker 4736 is normally open. In addition to overload relays, this breaker is equipped with reverse power relays for opening the breaker when the power flows toward Vida. When the power supply fails on the 44-kv. bus, breaker 4756 opens and breaker 4736 closes and restores power to the 44-kv. bus from Vida, unless there is a fault on the 44-kv. bus, in which case it locks out after the second reclosure. When voltage is again restored to the source part of breaker 4756, it closes and breaker 4736 is open, thus establishing normal service to the load. The reclosing oil circuit breakers 4786 and 4726 control straight radial feeders.

Demopolis is 99 miles from Jordan Dam. Breaker 5404, which is in the main line, is automatic reclosing and locks out after the second reclosure. This isolates trouble between Demopolis and Meridian and is equipped with impedance relays and with overload relays for back-up purposes. The low-voltage side of the bank is protected with automatic reclosing oil circuit breakers 5436 and 5432, both of which control radial feeders.

The Cuba primary substation transformer bank is protected by a 144-kv. automatic reclosing oil circuit breaker which is set to lock out after the second reclosure.

Breakers 102 and 104 at Meridian are equipped with overload protection, but no reclosing features. There are several 11-kv. automatic reclosing breakers installed in the Meridian primary substation on the radial feeders.

User Modifies Standard Control

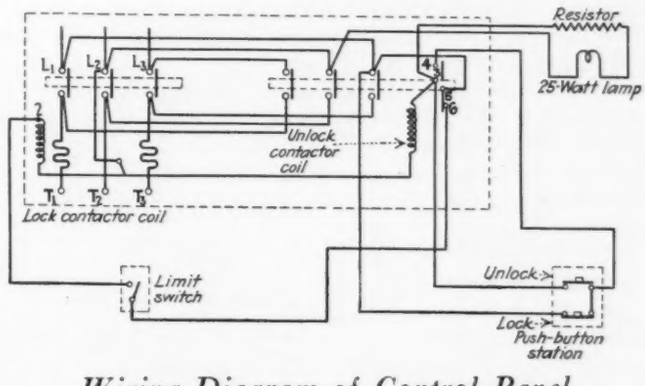
By O. E. Forswall

General Electric Company

MANY machines require special control when mechanical devices are replaced in order to make the machine automatic. The standard control panel is always most acceptable to machinery manufacturers and it is often possible to use standard devices and make slight modifications to suit particular requirements. A good example of a change made by a user is shown in the accompanying drawing. The material consists of a magnetic switch, a push button, a limit switch, an indicating lamp and its resistor.

A normally closed and a normally open interlock are required to obtain desired operations. The user removes the normally open interlock from the "lock contactor" and mounts it on the shaft of the "unlock contactor" with a fiber block. The two stationary contacts are also relocated and an aluminum cast cover is made for the push button with marking "Unlock—Lock."

Pressing the unlock button energizes a small motor driving a pump. A lever releases the limit switch,



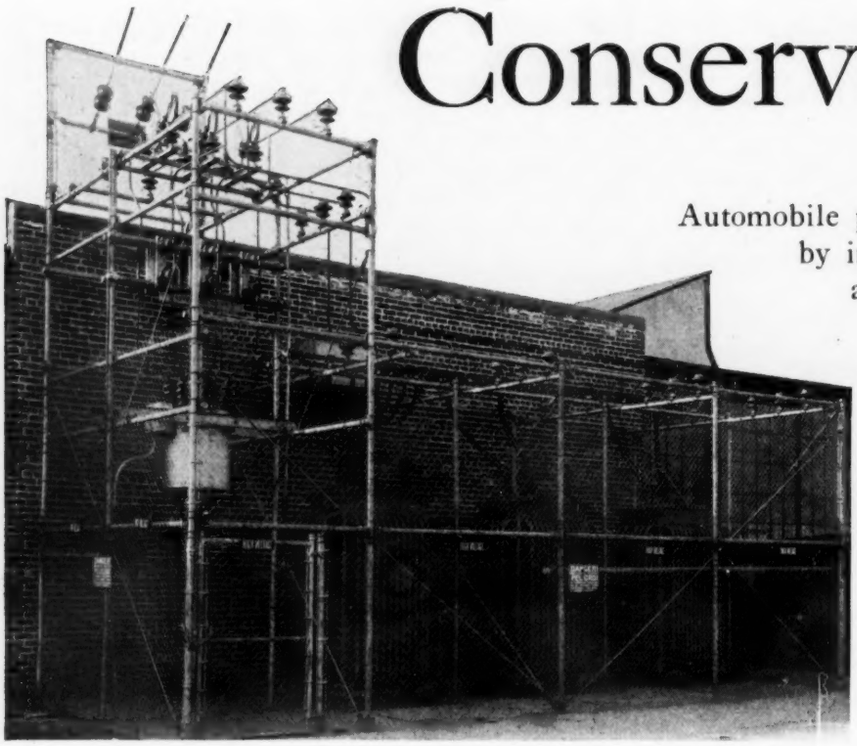
Wiring Diagram of Control Panel

allowing the contacts to close. Pressing the lock button de-energizes the "Unlock" contactor. When this contactor drops out a circuit is established to the lock contactor through the normally closed interlock and the limit switch. The opening of the limit switch at the end of travel shuts down the equipment.

The indicating lamp is used to show when the unlock contactor is closed. The external resistor connected in series with the lamp depends on the voltage used.

Conserving Floor S

Automobile plant increased working areas by improving distribution and apparatus arrangements



Brick Fire Wall Separates Transformer Bank from Plant Load Center

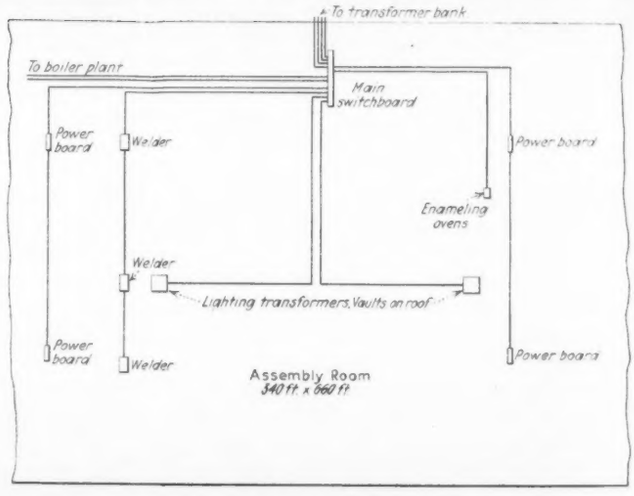
LAYOUT of the distribution system for the new automobile assembly plant of the Willys-Overland Pacific Company in Los Angeles was largely a problem of conserving valuable productive floor area and serving a connected load of approximately 1,500 kw. with a minimum of copper. The plant consists of a one-story assembly building 660 x 360 ft. with sawtooth roof construction, a detached office and administration building and a power plant containing air compressors, fire pumps and boilers for heating and other steam requirements.

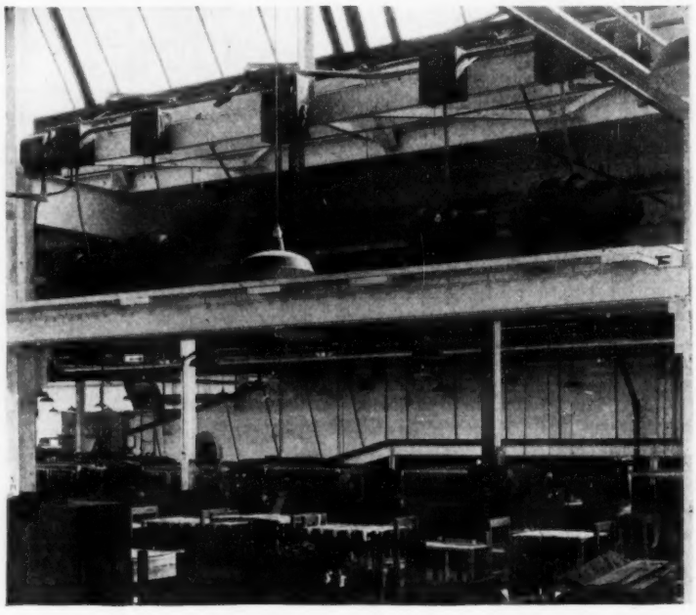
Sawtooth roof construction of the assembly plant permitted placing the main distribution board, sub-distribution panels, motor-generator sets for welding outfits and frequency changer sets for portable tool motors on platforms mounted in the space provided in the sawtooth areas. Several of these installations are shown in the accompanying illustrations.

Distribution Scheme

Distribution throughout the plant is at 440 volts, three-phase, with a main ten-panel board mounted on a platform or balcony centrally located with respect to the electrical load. A bank of three 500-kva., 16,000/440-volt transformers located outside the building opposite a brick fire wall section and at the minimum distance from the main board supplies the entire plant.

Four sub-distribution boards with feeders from the main board are symmetrically located with respect to floor space in the assembly plant. From these sub-distribution centers feeders are run to individual pieces of equipment or to distribution boxes mounted on steel columns. Lighting is supplied by two banks of three 75-kva., 440/220/110-volt transformers installed in fireproof rooms on the roof of the building and also symmetrically located with respect to the assembly plant. This



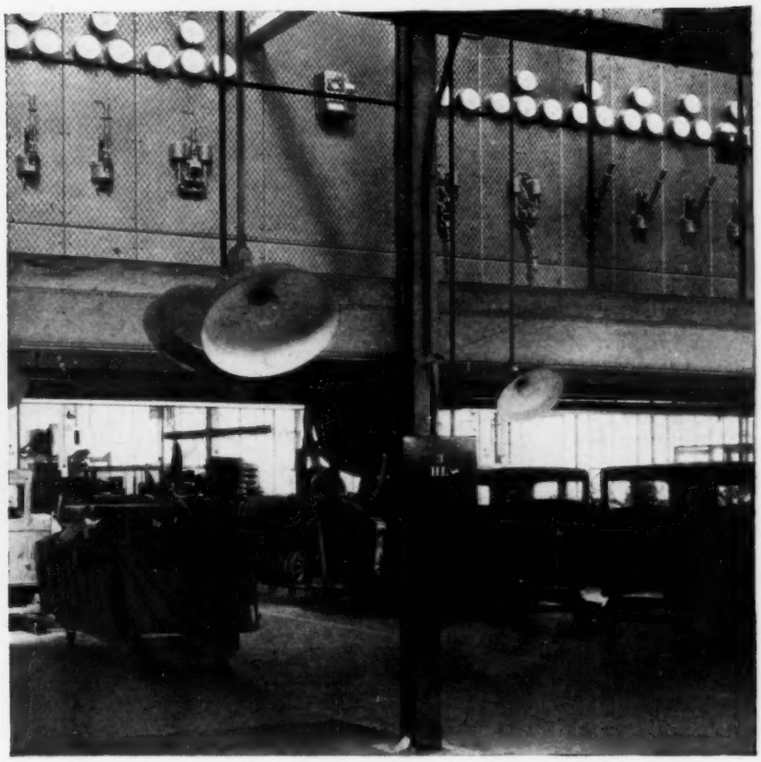


Sub-Boards Located at Electrical Load Centers

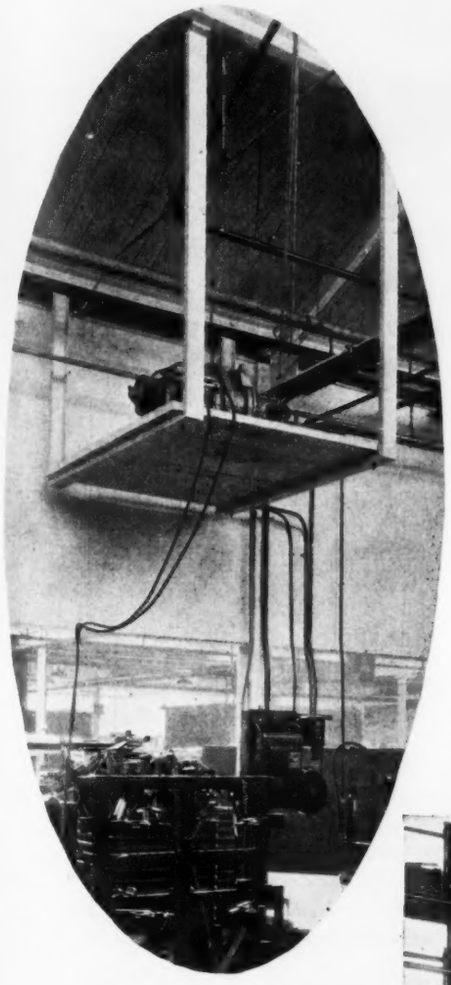
Frequency Converters Supplying 180 Cycles for Portable Tools

Space

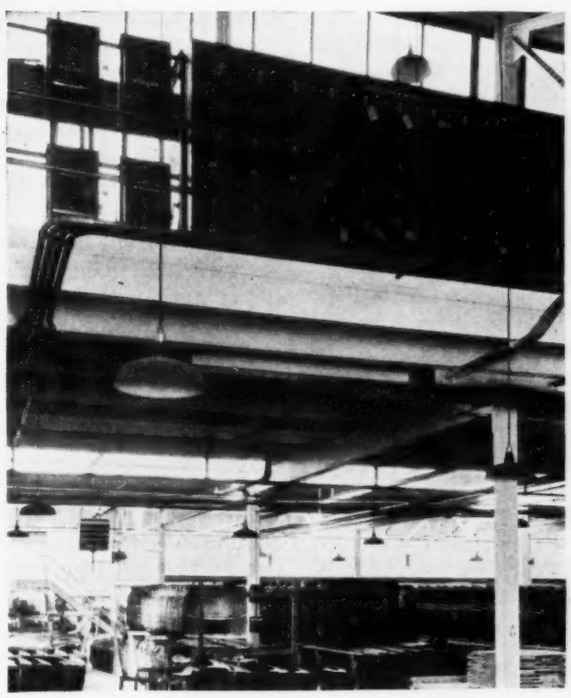
by Electrical Layout



Main Distribution Board on Balcony Conserves Floor Space



Motor-Generator Suspended Above Spot Welder



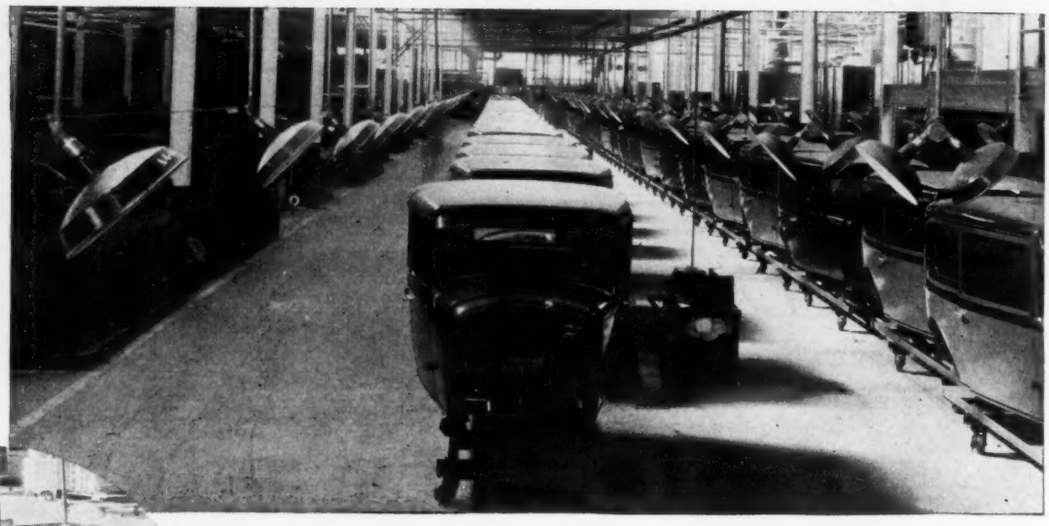
Utilizing Space Under Sawtooth Roof for Power Distribution Board

general scheme of distribution is shown in the accompanying diagram. Methods of utilizing otherwise unused space are also shown.

Electrical Applications

The plant is electrically operated throughout with the exception of steam for heating and a few miscellaneous requirements. Three electric enameling ovens of the conveyor type, all supplied from 440-volt, three-phase circuits, are used. One is of 66 kw. capacity and is used for small parts. This has recording pyrometers and automatic temperature control for maintaining the temperature at 280 deg. F. within a limit of 4 deg. variation. The two other ovens are for fender enameling and have a total connected load of 150 kw. They operate at 490 deg. F. and also are provided with recording pyrometers and automatic temperature control.

One of the interesting features in the plant is the use of three-phase, 220-volt, 180-cycle portable tools, this being among the first plants in the country to be so equipped. Service is supplied by two frequency converter sets, one for normal service and one for emergencies, mounted on a platform as shown in one of



Angle-Mounted Units Provide Illumination for Body Inspection

High Tool Speeds Eliminate Moving Contacts

the accompanying illustrations. There is now a strong tendency toward the use of 220-volt, three-phase, 180-cycle portable tool motors to obviate the difficulties experienced with various types of single-phase motors. The use of 180 cycles for portable motors has the advantage of permitting a maximum speed of approximately 10,000 r.p.m. in a motor of the rugged three-phase, squirrel-cage type with no moving contacts, and, most important of all, is much smaller and lighter than standard 60-cycle motors.

Automobile assembly work requires the use of a large number of portable tools, such as drills and screwdrivers, and to provide convenient points of attachment for these tools 200 drop cords with polarity receptacles are distributed throughout the plant.

In laying out the lighting installation special care was used to meet the exacting requirements of night work in automobile assembly. The most important night work from an illumination standpoint is body inspection, which requires high intensity and absence of shadows. To provide high-intensity, uniform illumination along the body inspection lines 200-watt lamps in "RLM" reflectors spaced on 8-ft. centers are mounted at an angle.

Other applications in the plant consist of fans for forced air circulation in connection with building heating in the winter and cooling in the summer, a motor-generator set for storage battery charging and overhead cranes.

The plant represents a well-laid out, neat and orderly job, all planned to the end that valuable floor space was conserved, investment in distribution was kept to a minimum and facilities provided for maximum economic production.

800,000,000 Kw.-Hr. for Swedish Electrochemicals

AS MIGHT be expected from the wealth of water power in Sweden a very large percentage (23 per cent) of the 4,000,000,000 kw.-hr. generated is used for electrolytic and electrothermic industries. Electric boilers are consuming as much as 7 per cent of the total, declares J. Koerner of Stockholm. Some 53 per cent goes to general industrial purposes, 11.7 per cent to households and small consumers, 4.3 per cent to railways and street car lines, leaving 1 per cent for sundries.

The total motive power in Swedish industry (1926) is equivalent to 1,190,000 kw., of which 77 per cent is electrical. The non-electrical drive has, on the whole, remained nearly constant since 1900; it has, in fact, fallen off slightly and the entire increase of power drive has been electrical. The combined mechanical and electrical power per laborer has increased from 1 kw. in 1900 to 3.2 kw. in 1926. The corresponding kilowatt-hours used per laborer per year are estimated at 4,500. In the same period of time (1900-1926) the electrical power per laborer has increased from 0.1 to 2.4 kw., or 2,300 per cent.

The largest users of electrical power are grinding mills, with 19 kw. per laborer, and paper mills (one of the most important manufacturing branches of Sweden), with 10 kw. The mining and metal industries with the paper mills use about 60 per cent of the total electrical industrial power. The two former industries are electrified to the extent of 88.5 per cent, textile mills about the same, paper mills 76 per cent and even woodworking, including sawmills, is 51 per cent electrified, notwithstanding much application of direct water-power drive, and steam from byproducts.

One of the most important Swedish industries, the electrochemical and electrothermic industry, consumed 800,000,000 kw.-hr. in 1926. The greatest part of the energy produced by the largest central station (Trollhättan) is being consumed for that purpose. It is estimated that there are about 200 electrically heated boilers in Sweden with an aggregate capacity of 100,000 kw.

An Electric Range *with a* Price Appeal

An Interview with

EDWARD T. GUSHEE

Manager Manufacturing Division, Edison Illuminating Company of Detroit

FOR twelve months or more there have been a number of rumors current throughout the electrical industry with reference to electric ranges. These reports have ranged all the way from extravagance to deprecation. They were brought to a head by an announcement, semi-confidential in character, which was sent out by the company to the executives of a number of the leading utilities in the country. This announcement was made just previous to the convention of the National Electric Light Association early in June. In spite of the very small number to whom this statement was sent, the information contained in it has spread very rapidly through the utility field and in a more or less garbled condition. Out of the maze of gossip and misinformation there appear one or two statements that are perfectly true. It is true that the Detroit Edison Company has developed an electric range which can be sold to the users at a price very much less than is carried by ranges now on the market. It is also true that the newly developed electric cooking stove is radically different in design and appearance from others now available. With the object of presenting an authoritative statement of this fact to the industry, the ELECTRICAL WORLD sought and obtained an interview with Edward T. Gushee, purchasing agent for the Detroit Edison Company, who has been in active charge of the development work on the new range.

A POLICY NEEDED

Before he was asked to give any definite information on the design and physical characteristics of the new range Mr. Gushee was asked to state the position taken by the Detroit Edison Company which led up to and finally determined its action. He said:

"For some years the executives of the Detroit Edison Company and of a number of other electric utilities have been of the opinion that the development of the domestic load, in which the electric range is one of the largest contributing factors, has been seriously hampered and impeded by two deficiencies in the ranges now available on the market. These deficiencies are, first, slowness of operation in comparison with other means of heat application and, second, the first cost of the device to the user. In spite of its many inherent virtues of control, cleanliness and other advantages of which the most has been made in selling campaigns, the electric range has remained distinctly in the luxury class when other heat sources than electricity were available.

"It was strongly felt that these objections to the range from the standpoint of the user brought about the failure by manufacturers to approach objectively the problems of design and to profit by the lesson of mass production that are so conspicuously apparent in the reduced cost of many manufactured articles in the United States. Efforts were made by my company and also by other companies to convert manufacturers to this point of view, but they met with little success; in fact, with none at all.

"Action in this situation and on these opinions has been accelerated in the case of the Detroit Edison Company by a new and growing competition that in the past two or three years has become very active in the one field in which the electric range has been conceded better than a luxury position; that is in rural areas and in small towns where manufactured or natural gas was not available. There have been important improvements in oil-burning cook stoves and a large widening of the use of gas sold in portable and returnable containers. It is most important that in the lean service fields, where this competition was most strongly felt, energy consumption should rapidly increase, if the economical justification of the extension of electric service mostly contemplated as a future consummation is to be realized. Therefore, any tendency to diminution of consumption in any direction must be intelligent and vigorously combated as early as possible with all of the resources at hand."

BIRTH OF THE "ELECTROCHEF"

"How long has the company been working on this situation and how did you go about to find an answer to it?" Mr. Gushee was asked. He replied:

"Somewhat more than a year ago a committee was formed in the company to study the problem and to arrive at a means for handling it. This committee got together all the facts in regard to the cost of supplying energy to low-density areas within the Detroit system. The committee also had all of the costs applying to service to domestic users in the more thickly populated areas. In both of these conditions it was immediately apparent that if the domestic load was to grow and to assume its proper importance in the system there must be wide use of some appliance or device of large energy consumption characteristics. The electric range appeared to be the entry on which the best hopes could be pinned. Obviously an electric range to which many housewives objected on account of slowness of operation and which sold at a price three or four times that of a gas or oil stove could not be considered. The problem then became one of producing a range that would be fast to cook with and that could be sold at a low price. The 'Electrochef,' characterized by Mr. Dow as a 'cooking machine,' was born.

"We realized that in order to attain the qualities of speed in cooking and low price we would have to depart considerably from accepted ideas in range design and manufacture. The latter consideration was the more important and to a large extent it determined the design. We had to have a design that could be simply and easily constructed and that would fit into the idea of mass production and consequent low cost. The 'Electrochef' as

it stands now is primarily the work of Warren Noble of the firm of Noble & Harris, consulting engineers, with, of course, suggestions and comments from Detroit Edison men. Mr. Noble is not an electrical engineer; his work for many years has been concerned with production problems in the automobile factories of Detroit. This was the reason for his selection for the job, the matter of design in relation to production being the principal element in the cost phase of the problem. The importance of this element is indicated in our quotation of $85 to utilities for sample ranges, which will be delivered shortly, and by our belief that this price may be reduced to $40 or $50 when the production capacity of the not very large factory we are now getting into shape is fully utilized."

Mr. Gushee then took the interviewer out to the factory to see one of the sample ranges. He said: "'Electrochef' is not in any way or manner copied from existing ranges, as you see. We think its features of design and performance are wholly original and we have covered them with patent and copyright protection. It looks different and it performs differently. It uses less energy for an equivalent cooking duty than other ranges that have been tested in comparison with it. Its table elements are 15 to 30 and its oven 100 or more per cent faster than others tested. The oven comes up to 500 deg. F. from room temperature in less than five minutes. The oven is air insulated, being composed of three drawn steel shelves nested together with two air spaces between. As you see, practically the whole construction is of pressed steel. Production, therefore, is largely a matter of stamping and drawing steel sheets, a process that, once tooled up, is very fast."

The operating conditions that entered into the design of the range appear to have been covered admirably. Faster cooking speed has been attained by radical departures in heating element design, chief of which is a major utilization of radiant heat in both the table and the oven units. The four table units are mounted in a chromium-plated reflector and are of macrom wire coiled around a cone-shaped porcelain holder in the center. The inner shelf of the oven is chromium plated, as are also all the other corrodible parts. Other exposed surfaces are white enameled. Cleanliness is assured by the fact that every surface, including the heating element, is accessible and may be washed with soap and water.

The appearance of the range requires a readjustment of the common idea of what a cook stove should look like. This is the result of approaching the problem of design without any preconceived ideas of appearance, and it may or may not militate against general acceptance of the range. It has the virtue, however, in spite of its looks, that the floor underneath may be very easily kept clean. Given adequate supporting points in the kitchen wall, it is possible to do away with the legs entirely.

"It must be understood," said Mr. Gushee, "that what you see is the first design and that changes in appearance may later appear to be desirable. We fully expect that the design will undergo some minor modifications as experience under household conditions accumulate, but we do not think that such modifications will be radical or extensive.

"There is a final most important consideration that we want to have very clearly understood by both utilities and manufacturers," continued Mr. Gushee. "This is that it is not the intention of the Detroit Edison Company or of its subsidiary, the Edison Illuminating Company of Detroit, to engage permanently in the manufacture of this range. We have designed it and we are offering it to the industry simply because we felt that something radical had to be done in order to build up the domestic load. Our interest is in the manufacture and sale of kilowatt-hours, not electric ranges. The factory that you see here will be able to put out about 200 ranges per day when it gets into production. We have established this factory for only one reason, and that is to show that the job can be done.

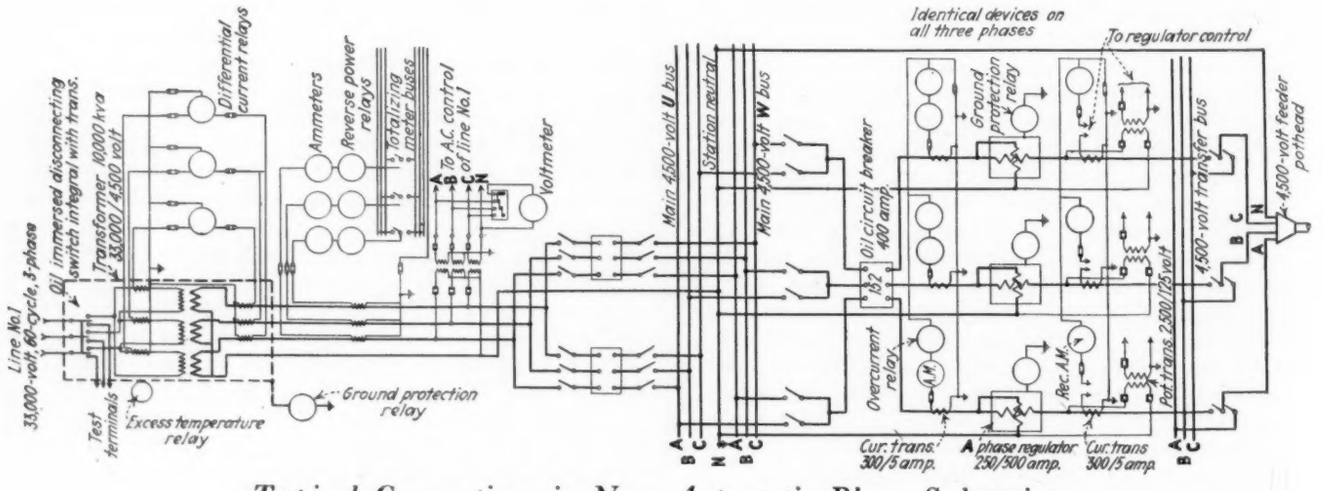
"We want to get the range solidly established as a manufacturing and merchandising proposition. When we have done that we will go out of the business."

Direct-Tie Automatic Substation

By Gordon W. Gerell

Substation Engineer Union Electric Light & Power Company, St. Louis, Mo.

FAULT bus protection without the installation of the actual bus is afforded in certain measure by the use of ground protection relays in the new automatic Plaza substation of the Union Electric Light & Power Company at St. Louis. As is shown in the accompanying



Typical Connections in New Automatic Plaza Substation

Electrolytic Cell Plants Using Central-Station Power for Dissociation of Water

Compiled by Paul McMichael

California:	Los Angeles	California Compressed Gas Company
	San Diego	U. S. Army
	San Francisco	Stuart Oxygen-Hydrogen Company
	San Francisco	Union Iron Works
Colorado:	Denver	Colorado Compressed Gas Company
Delaware:	Wilmington	Pusey & Jones
Florida:	Pensacola	U. S. Navy
Georgia:	Gretna	Southern Cotton Oil Company
	Savannah	Southern Cotton Oil Company
Illinois:	Chicago	Acme Oxy-Acetylene Company
	Chicago	Armour & Company
	Chicago	Burdette Oxygen Company
	Chicago	Swift & Company
	Peoria	Commercial Solvents Company
Indiana:	Garey	Illinois Steel Company
	Logansport	Logansport Oxygen Company
Iowa:	Bettendorf	The Bettendorf Oxygen & Hydrogen Company
Kentucky:	Louisville	Kentucky Oxy-Hydrogen Company
Louisiana:	New Orleans	Louisiana Oxygen Company
	Shreveport	The Bain-Beard Company
Maryland:	Sparrows Point	Bethlehem Steel Corporation
Massachusetts:	Cambridge	Massachusetts Institute of Technology
	Charlestown	U. S. Navy Yard
	Everett	New England Compressed Gas Co.
Michigan:	Detroit	Wall Brothers Company
	Grand Rapids	Grand Rapids Welding Supply Company
	Muskegon	Michigan Ox-Hydric Company
Minnesota:	St. Paul	Ford Motor Co.
Missouri:	Kansas City	Ox-Hydrogen Manufacturing Company
Montana:	Butte	The Anaconda Company
Nebraska:	Omaha	The Balbach Co.
New Jersey:	Bloomfield	Westinghouse Lamp Company
New Jersey: (*Continued*)	Camden	N. Y. Shipbuilding Company
	Harrison	General Electric Company
	Lakehurst	U. S. Navy
	Little Ferry	General Electric Company
	Newark	International Oxygen Company
	Princeton	Princeton University
New York:	Brooklyn	U. S. Navy Yard
	New York	Columbia University
	Port Ivory, S. I.	Procter & Gamble
	Schenectady	General Electric Company
Ohio:	Cleveland	General Electric Company
	Cleveland	Ohio Chemical & Manufacturing Company
	Columbus	Gas Products Company
	Dayton	Dayton Oxy-Hydrogen Products Company
	Dayton	U. S. Army
	Wyckliffe	Clark Chemical Company
Oklahoma:	Oklahoma City	Burdette Oxygen Company
Oregon:	Portland	Portland Oxygen-Hydrogen Company
Pennsylvania:	Butler	Standard Car Wheel Company
	Darby	Fels Naphtha Company
	Germantown	Paschall Oxygen Company
	Oakmont	International Oxygen Company
	Pittsburgh	Burdette Oxygen Company
	Pittsburgh	Carnegie Steel Company
	Warren	Struthers, Wells & Co.
	York	York Manufacturing Company
Tennessee:	Chattanooga	Burdette Oxygen Company
	Chattanooga	The Lookout Oil Company
Texas:	Beaumont	Magnolia Gas Products Company
	Houston	Magnolia Gas Products Company
Utah:	Salt Lake City	Utah Compressed Gas Company
	Salt Lake City	Whitmore Oxygen Company
Virginia:	Newport News	Newport News Shipbuilding Company
	South Washington	Southern Oxygen Company
Washington:	Seattle	Pacific Nitrogen Corporation
West Virginia:	Wheeling	Wheeling Molding & Foundry Company
Wisconsin:	Kenosha	Wisconsin Oxygen-Hydrogen Company
	Racine	Newport Chemical Company
	Sheboygan	Universal Oxygen Company

drawing, these relays are connected between the transformer and regulator cases and the station ground. The cases rest on the concrete floor and are not insulated from it, but the current path to ground is of lower impedance than through the concrete. The relays are instantaneous type and operate on a current of 40 amp. or more. The effect of operation of one of the ground relays is to clear the particular equipment and lock it out from automatic operation until the relay is reset by hand.

Another feature of this substation is the manner of connection of its feed from Cahokia station, on the other side of the Mississippi River. The 33-kv. submarine and underground transmission lines from Cahokia are tied solidly to the transformer primaries. The connection can be broken by means of double-throw disconnecting switches, through which the cable conductors may be thrown onto a set of test terminals which emerge from the transformer case.

The station contains two main distribution buses, not primarily for service reliability, but to limit the short-circuit capacity of any single bus unit. The present installation includes two 33-kv./4.5-kv., 1,000-kva. transformers; the ultimate installation will consist of five, two on each bus and one spare. Thus the station will have a capacity of 40,000 kva. with 10,000 kva. reserve. The scheme of automatic operation is such that if any transformer is disconnected the spare will replace it. When, and if, the regular transformer reconnects to the bus, the spare will drop out. Unless a bus is dead, in which case it operates without delay, no transformer breaker will close on the bus until a ten-second synchronizing check is completed.

71 Electrolytic Cell Plants

THE accompanying list of electrolytic cell plants using central-station energy was compiled by Paul McMichael, has been checked by several other authorities acquainted in the field and is believed to be substantially correct.

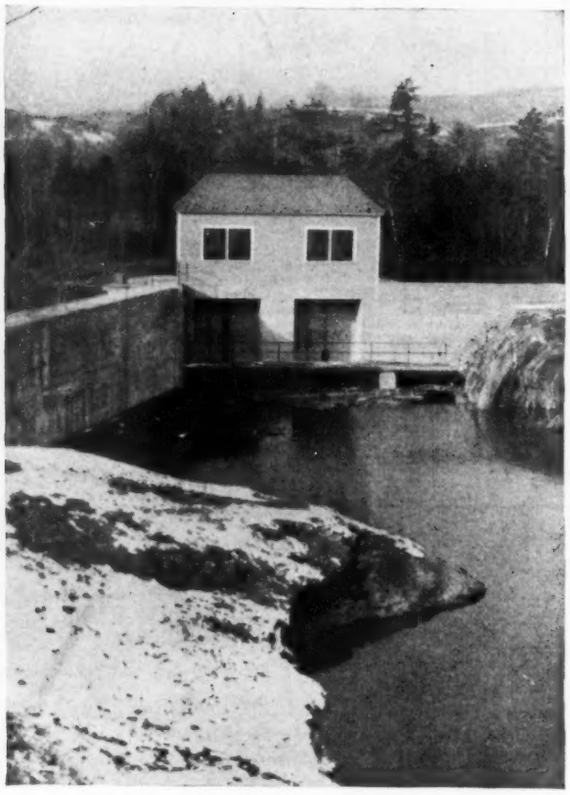
Spending Money to Earn More

"IN THE confidence that these low rates (for domestic service), coupled with a generally high level of purchasing power and the steadily increasing demand for household conveniences and labor-saving devices, would encourage a more liberal utilization of electrical appliances and the acceptance by our customers of improved and more adequate standards of lighting, the company, coincident with the reduction in rates, inaugurated the most vigorous and comprehensive load-building campaign in its history, involving the expenditure of almost one million dollars for advertising and sales work. The results of this campaign justified expectations, contracts for new business yielding an estimated annual revenue of $4,579,298 being signed in 1928, exclusive of routine applications for service."

From the annual report of the Pacific Gas & Electric Company for 1928.

Output Nearly Trebled by H

Increased use of Winooski River follows Vermont flood. Modernizing hydraulic and electrical designs for better service at Middlesex development



Forebay, Intake, Rack Platform and Gate Recesses

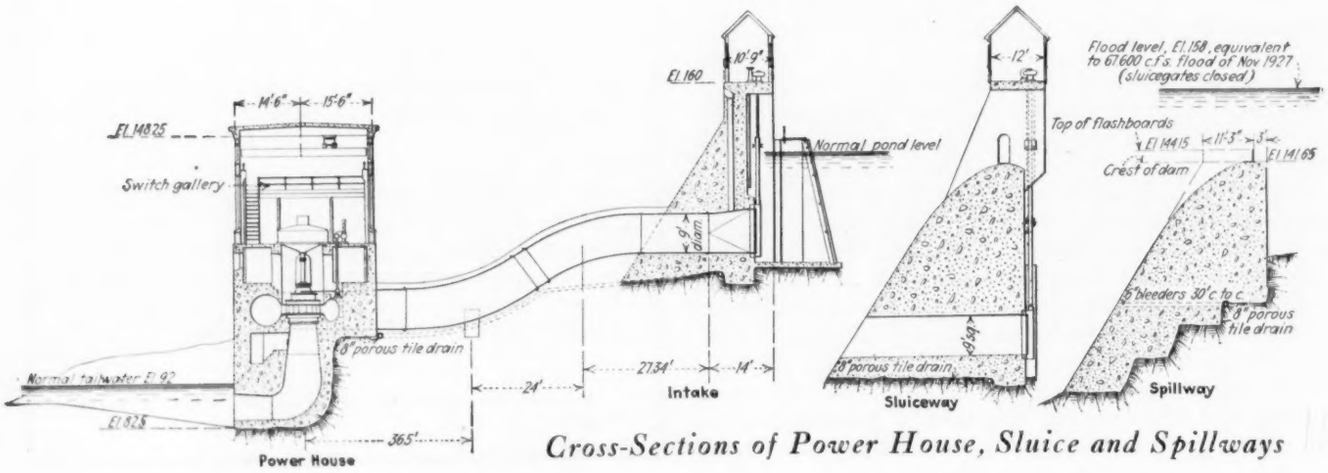
THE unprecedented flood in Vermont in November, 1927, seriously crippled all but one of the generating plants of the Green Mountain Power Corporation, a subsidiary of the Peoples Light & Power Corporation, New York City. At that time the company operated seven hydro-electric stations on the Winooski River and its tributaries, ranging in capacity from 300 to 5,000 kw., with a steam plant of 6,000-kw. rating in Montpelier. During the flood the Molly's Falls station, designed by Chas. T. Main, Inc., Boston, and built in 1926 (capacity 5,000 kw.), was the only hydro-electric plant of the company in service. This plant is 16 miles from Montpelier and carried a load for 68 hours without communication with headquarters. It is designed to provide peak load capacity, operates under a head of 375 ft. and was of great use during the reconstruction period following the flood, when vitally essential repairs were being made and important redevelopment work undertaken. In the latter field the rebuilding of the company's Middlesex plant is of considerable interest, since the original development of 1,200 kw. rating was badly damaged by the flood, and through modern engineering design this has been reconstructed to deliver 3,200 kw.

Original Middlesex Development

The company's Middlesex plant was damaged to such an extent by the flood and the equipment and structures were of such obsolete design that it was deemed advisable to provide an entirely new development of modern design and construction. The company had made plans for the redevelopment of this plant during 1928 and the flood merely hastened this construction by a few months.

The original development, built in 1895, consisted of a timber crib spillway dam 145 ft. long, a canal 560 ft. long, excavated in rock, with gates and racks at both upper and lower ends and with two side outlet spillways, of 86 ft. total length, discharging into the river; two steel penstocks about 150 ft. long, one 9 ft., the other 13 ft. in diameter; a power house with three horizontal turbines belt-connected to two generators having a combined capacity of 1,200 kw., and four steel draft tubes about 60 ft. long extending along the surface of the ground between the turbines and the river.

The main diversion dam was completely washed away



Cross-Sections of Power House, Sluice and Spillways

y Hydro Plant Redevelopment

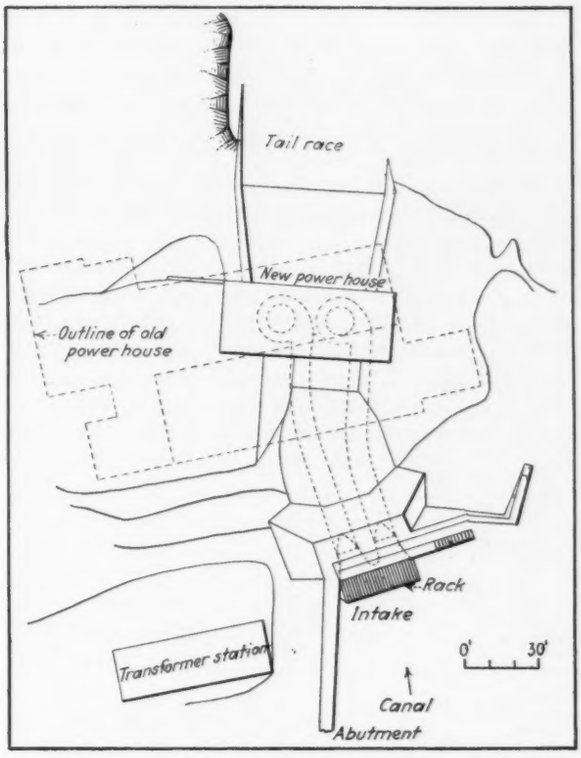
By
J. D. FITCH
Resident Engineer
Chas. T. Main, Inc., Boston, Mass.

by the flood. The remaining structures and equipment were partially damaged.

The governing feature in the plan for a new development was the necessity of providing a spillway of sufficient length to take care of a flood somewhat greater than the 1927 flood, without raising the river level excessively above the dam. The required length was difficult to obtain on account of the narrowness of the gorge at this point.

The drainage area of the Winooski River at Middlesex is about 520 square miles. The peak flow of the 1927 flood was about 67,600 cu.ft. per second or 130 cu. ft. per second per square mile of drainage area. The depth of water in the gorge at the peak of the flood was about 50 ft., in contrast with the normal depth of about 5 ft.

In order to secure the desired spillway length the new dam was located about 350 ft. downstream from the site of the old dam. The top of the flashboards on the new dam was kept at the elevation of the crest of the old dam.



Plan of Old and New Power House Locations

UNIT SPACE SAVINGS IN NEW DESIGN

The new power house is located on the site of the old one. The compactness of the modern type power house is illustrated by a comparison of the new structure with the old. The new power house contains equipment of 3,200 kw. capacity and occupies a ground area of 2,100 sq.ft. The old power house, with only 1,200 kw. capacity, occupied a ground area $3\frac{1}{2}$ times as large.

The turbine installation consists of two wheels, each rated at 2,400 hp. when operating under the normal net head of 50 ft. Each turbine is direct connected to a 1,600-kw. generator. The plant will utilize a flow of about 1,000 cu.ft. per second at full load.

The dam is of the gravity overflow type, of 50 ft. maximum height and 270 ft. effective spillway length. The foundation is rock, a mica schist formation with ver-

General View of Middlesex Development

tical stratification. The dam consists of two sections, one being 83 ft. long at right angles to the north bank, containing two 9-ft. x 9-ft. sluiceways, and a section 195 ft. long extending along the south bank to complete the required length of spillway. To provide access for flood flows to the latter section an approach channel was excavated in the rock.

With flashboards out and water level 16 ft. 6 in. above the crest, the spillway will discharge 67,600 cu.ft. per second, equivalent to 130 cu.ft. per second per square mile of drainage area. This is the estimated peak flow at Middlesex during the 1927 flood. The sluiceways will discharge an additional 4,000 cu.ft. per second under these conditions. The depth of water over the dam could be considerably greater without danger to the structure.

Flashboards 30 in. high, supported by steel pins 3 ft. on centers, are provided for the entire length of spillway. The pins for a section of flashboards 75 ft. long are designed to release the boards with water 2 ft. 6 in. deep over the top. The rest of the flashboards will go out with 3 ft. 3 in. depth of water over them.

The sluiceways are controlled by timber gates connected by structural steel stems to individual motor-driven hoists of 75 tons capacity. The hoists, designed by Chas. T. Main, Inc., have phosphor-bronze nuts and worm wheels and hardened steel worms completely housed and running in oil. Limit switches control both directions of travel of the gates. To provide an unobstructed spillway, the gate stems are located in shafts in the concrete piers which support the gatehouse.

The principal function of these gates is the control of the pond level during small freshets, which occur frequently, thus preventing the frequent loss of the flashboards and the temporary loss of head.

An unusual condition was presented by the location of the greater part of the dam on the steep side hill slope of the river bank. To secure satisfactory resistance against sliding the rock slope was benched to give horizontal foundation surfaces. In addition steel dowels bond the concrete base to the rock.

Protection against uplift on the base is secured by a drainage system, consisting of an 8-in. porous tile drain parallel to and about 8 ft. from the upstream face of dam, with 6-in. bleeders 30 ft. on centers from this drain to the toe of the dam.

To prevent erosion at the toe of the dam by overflow and sluice discharge a stilling pool dam is provided about 200 ft. below the sluicegate section, with crest at the same elevation as the floors of the sluiceways. Due to the narrow width of gorge at this point a stilling pool of great depth will exist with any considerable amount of water flowing over the spillway.

The old canal was utilized by removing the old gate structures and enlarging restricted sections to 26 ft. width by 14 ft. depth. The maximum velocity at full load is 2.75 ft. per second. The old side outlet spillways were removed to increase the area of approach to the dam.

The new intake is a gravity type concrete structure about 45 ft. high, located about 100 ft. downstream from the old intake to permit of a greater depth of seal above the top of penstocks so that surface velocities will be avoided.

Rack bars are 3 in. x $\frac{5}{16}$ in., spaced $3\frac{5}{16}$ in. on centers, at an angle of about 12 deg. from the vertical. The gross area of racks is 740 sq.ft., net area 610 sq.ft., and the velocity through the racks at full load is 1.65 ft. per second.

The openings to the penstocks are 9 ft. x 10 ft., with timber gates operated by hoists similar to those at the dam. The hoists have a capacity of 50 tons, which is sufficient to operate them under full load in case of emergency. They are motor operated, with remote control at the power house switchboard.

Two 18-in. hand-operated cast-iron filler gates provide for filling the penstocks and balancing the pressure on the large gates prior to their opening and two 18-in. air vents to the penstocks are built into the intake below the gates and provided with openings through which oil may be poured to prevent their freezing in cold weather. Hoists, motors and control apparatus are housed in a gatehouse.

Two 9-ft. diameter steel penstocks about 80 ft. long connect the intake with the turbine scroll cases. Penstocks are backfilled with a minimum cover of 18 in. of earth for protection against freezing.

The substructure of the power house is of concrete founded on rock. The superstructure, which is 70 ft. long, 30 ft. wide and 24 ft. 3 in. high from the main floor to the roof beams, is of structural steel frame construction with brick walls, concrete roof and steel window sash. The main generator floor is 4 ft. above the 1927 flood peak tail-water level at this point. All electrical equipment is located well above the flood level.

The easterly bay of the power house contains the switchboard on the generator floor level and the low-tension switching equipment on a gallery floor directly above the switchboard. A tailrace about 80 ft. long, excavated in rock, leads from the concrete draft tubes to the river. A 15-ton hand-operated traveling crane is provided for handling the equipment.

List of Equipment Installed

Item	Quantity	Manufacturer	Description
Intake gate hoists	2	D. J. Murray Manufacturing Company	50-ton, motor-operated.
Sluicegate hoists	2	D. J. Murray Manufacturing Company	75-ton, motor-operated.
Hydraulic turbines	2	S. Morgan Smith Company	2,400 hp., 50 ft. net head. 200 r.p.m. vertical single runner.
Generators	2	Westinghouse Electric & Manufacturing Company	2,000 kva., 1,600 kw., 200 r.p.m., 2,400 volt, three phase, 60 cycle, vertical, with 21-kw., 125-volt, direct-connected exciter.
Switching equipment	...	General Electric Company	Low-tension O.C.B.—FKR132B. High-tension O.C.B.—FKO-136.
Transformers	3	General Electric Company	1,333 kva., single phase, 60 cycle, O.I.S.C., 2,400 to 33,000 volts.
Storage battery	1	Electric Storage Battery Company	60-cell type KXF11.

Electrical Equipment

The generating equipment consists of two 2,000-kva., 0.8 power-factor, 2,400-volt, three-phase, 60-cycle, 200-r.p.m., vertical waterwheel generators with 21-kw., 125-volt, direct-connected exciters.

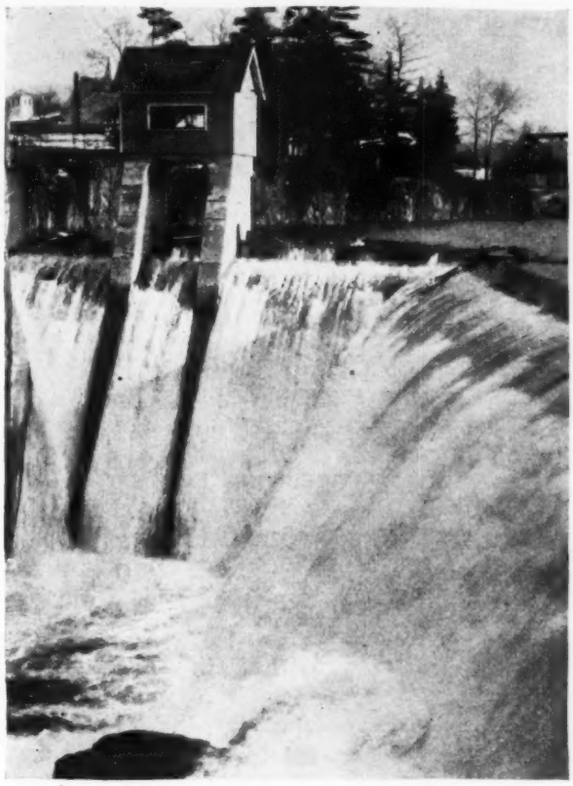
The governor flyballs are driven by jackshafts geared to the main shafts of the units. Governor oil pressure is supplied by motor-driven pumps.

The control for the governor oil pumps is so arranged that the motor controller will not open when low voltage occurs due to faults on the system.

The generator energy is delivered to the 2,400-volt bus located on the gallery floor above the switchboard in the east bay of the power house.

Oil circuit breakers for the generators, transformer low-tension leads, station power and a distribution line to the nearby village of Middlesex are also located on the gallery. All electrical equipment is located at as high an elevation as practicable, because of a possible recurrence of the flood conditions of 1927.

Local conditions were unfavorable for carrying economically the low-tension transformer leads underground from the power house to the outdoor transformer station so that overhead leads were resorted to.



Sluicegate Stems Located in Gatehouse Piers

The control cables and the local distribution line were also carried overhead.

The transformer station is of the outdoor type with a galvanized steel structure provided to support the buses and switches. It is located on a hillside about 120 ft. from the power house. Three 1,333-kva., single-phase, 2,400 to 33,000-volt transformers are installed. An oil circuit breaker and motor-operated air break switch are provided on the high-tension side of the transformers.

The outgoing lines are connected to the transmission lines which tie the Burlington and Montpelier sections of the company's system together through a sectionalizing station located a short distance from the transformer station.

As the site of the sluiceway section of the dam was located in a narrow part of the gorge, it was necessary to resort to the use of flumes for river diversion.

These flumes were 7 ft. wide and 6 ft. high, built of 3-in. matched lumber, and were located so that the permanent sluiceways could be built around them. Rock-filled cribs were first sunk to provide supports for the flumes. A rock-filled crib dam at the upper end served to divert the water and a similar dam at the lower end protected the work from backwater. After unwatering the site, the flumes were shored up and the supporting cribs removed. Concrete was then placed under the flumes and the shores removed. An ordinary rock-filled crib coffer sufficed for unwatering the tailrace and power house site. All pumps were motor driven.

The principal items of work consisted of 6,500 cu.yd. of rock excavation and 11,700 cu.yd. of concrete.

All materials, equipment and machinery were received at a railroad siding ½ mile from the power house. Transportation to the site was by trucks, except for the heavy pieces of machinery, which were moved on skids.

Construction work was started in May, 1928. The first concrete was poured June 9. The first unit was placed in operation on November 16 and the second unit on Nov. 26.

The Middlesex development was designed and its construction supervised by Chas. T. Main, Inc., engineers, of Boston, Mass. Fred T. Ley & Company, Inc., Springfield, Mass., were the general contractors. R. A. Langley was field superintendent for the contractor. The writer acted as field engineer for Chas. T. Main, Inc.

Promotional Rates Improve Usage Classification

A STRIKING shift in residential classified service usage has occurred among the domestic customers of the Hartford Electric Light Company during the period in which promotional rates have been in effect. This is shown by the accompanying table, presented by President Samuel Ferguson of that company during a recent lecture at Yale University. In 1921 Hartford had a straight meter rate under which 90 per cent of the residential customers used less than 500 kw.-hr. per year. Last year, after eight years' experience with the promotional rate, but 66.4 per cent used less than 500 kw.-hr., and those using more than 700 kw.-hr. per year had increased from 2.8 to 16.3 per cent. In the case of company "X," which has no modern promotional rate, the percentage of small users in 1928 compared on fairly even terms with Hartford's situation eight

Classification of Customers by Usage

Yearly Kilowatt-Hours Used	Per Cent of Customers in Each Class		
	Hartford Year 1921	Hartford Year 1928	Company X 1928
0–120	17	7.1	26.8
121–240	37	20.8	40.4
241–360	25	22.2	18.0
361–480	11	16.3	6.2
Total under 500	90	66.4	91.4
481–600	4.7	10.8	3.2
601–720	2.5	6.5	1.4
Over 720	2.8	16.3	4.0
	100.0	100.0	100.0

years ago. Part of this growth in larger bracket usage is of course due to other factors than the rate, but the influence of the rate is at least impressive.

Electric Type Casting Speeds Papers to the Street

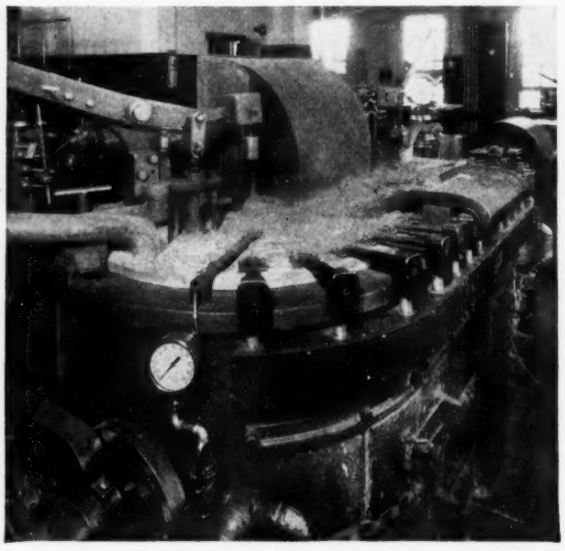
By J. H. Faulkner
Commonwealth Edison Company, Chicago, Ill.

IT IS faster to deliver a set of matrices in one truck than to distribute 70,000 newspapers in a fleet of trucks. This was the theorem accepted by the Chicago *Daily News* in the establishment of its north side plant, about 5 miles from the main office. The branch plant, which is a complete mechanical production unit with a capacity of 40,000 papers per hour, justifies its existence by beating other newspapers to the street in its area by about twenty minutes.

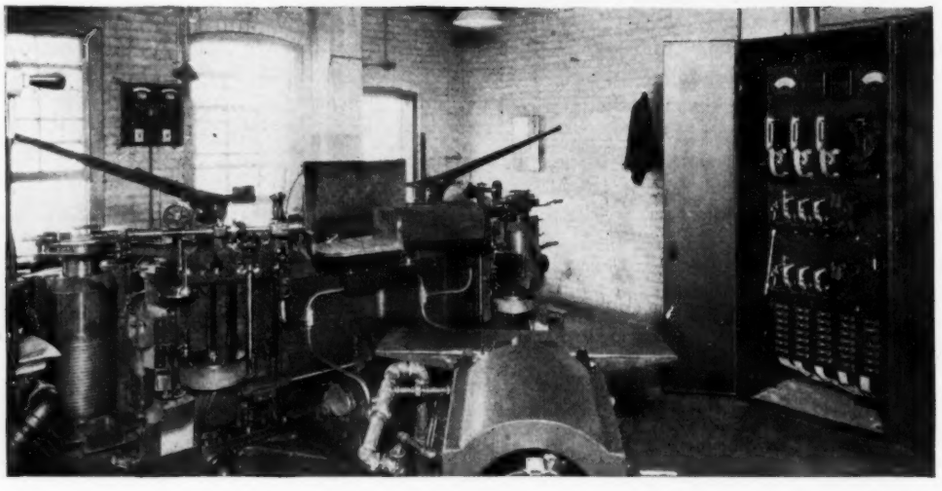
A conspicuous factor in this speed of production is the electric stereotyping equipment, which consists of a Wood Junior autoplate machine holding 8 tons of metal and with 160 kw. connected in sixteen immersion heaters. The paper is made up in the main office and the matrices produced there. When the matrices arrive at the branch, eleven to fifteen minutes after they have come off the scorchers downtown, they are immediately started through the two casting boxes of the machine. The plates are produced at the rate of four per minute, which means 200 lb. of metal cast, and are hurried to the presses. Within a few more minutes papers begin to pour out in the street. The branch plant has been producing for six or seven months now and at no time has it performed other than well.

The 10-kw., 230-volt units of the plate-casting machine are hooked up in a delta-star, three-phase throwover connection. This control, together with contactor control of the number of units in operation, permits very close regulation of the metal bath temperature. The casting heat of 620 deg. F. can be held without more than 10 deg. variance irrespective of the speed of casting and the amount of cold metal replacement. When the unit is not in operation, as overnight, the metal is kept at the stand-by heat of 500 deg. F. Thirty to forty per cent of the energy input is represented by heat lost in radiation. This is one reason for the stand-by reduction to 500 deg. F., the loss at this temperature being 8 kw., and at the casting heat, 15 kw. Another reason is that slag forms more slowly on the surface of the metal bath at the lower temperature.

It is difficult to arrive at any statement of electrical performance of a particular stereotype pot because the conditions of operation are extremely variable. The number of plates cast by a metropolitan newspaper depends on the size of the paper each day, the number of presses in operation, changes in editions, the coincident characteristics of the other electrical load and such special factors. The performance of an equipment on one newspaper cannot be taken as applying to another, nor is the performance of one day necessarily like that of another on the same newspaper. Therefore, the data on this particular installation are given here only for what they are worth. The average monthly consumption for six months has been in the neighborhood of 15,000 kw.-hr.



Sixteen 10-Kw. Units Heat This 8-Ton Type Metal Pot



Casting Machine in the Branch Plant of the Chicago "Daily News"

At the right is the control panel and in the foreground the casting bed.

Although its connected load is 160 kw., the pot is responsible for an increment of 20 kw. in the total 30-minute electrical demand of the plant.

Letters from Our Readers

The Unethical Professors

To the Editor of the ELECTRICAL WORLD:

Recently the daily press carried news items gleaned from the Federal Trade Commission's grist from the files of the National Electric Light Association. Three prominent members of electrical engineering faculties are reported to have been paid $5,000 a year each for technical advisory services. Several others unnamed had remitted to them expenses incurred in attending N.E.L.A. conventions or section meetings. In the former instances we shall presume that the reward was commensurate with the service rendered. Let us examine the other group of cases, classified under the heading remitted expenses.

We have direct knowledge of one of these cases, an associate professor of engineering who was invited to serve on one of the technical committees of the N.E.L.A. He accepted and was appointed chairman of a subcommittee including most of the authorities in a highly technical phase of system planning and operation. The culmination of the subcommittee's activities was a serial report which made available to the whole industry the authentic facts, technical statistics, research results and operating experience pertaining to an important development which was just emerging from the pioneer stage. The college professor bore the brunt of the subcommittee's labors (that is what chairmen are said to be for) and he received no pecuniary reward whatever for his services, merely remission of travel and hotel expense to the group meeting at which his subcommittee could most logically be convened.

But that's not the half. This same professor has received retainers from the Public Service Commission of his state for technical service and did so during the same year in which he was reimbursed by the N.E.L.A. Still we see nothing unethical in his duplicity, nor have we been able to observe the slightest taint of influence upon his impartiality in his services to the citizens of his state. In fact, we have never seen more scathing denunciations of electric utility companies for hazardous construction or operating methods than are some of his reports to the commission. Nor have we heard any unfavorable comments upon his efforts to expound blandly to his students of the university the alluring circumstances which have led to the holding company development, with all its potentiality for abuse, at the same time that he acknowledges the economic benefits from the newer unity of control.

This, however, is the age of debunking and innuendo in press and literature and we must bear with similar manifestations on the part of our governmental agencies in their efforts to clarify an impression containing so many ingredients as the power industry presents. The implication that a college professor approaches the unethical, *prima facie*, in accepting the opportunity for technical service that will advance the industry, enlarge his horizon in the practical field and help make better the next crop of embryo engineers is resented, if it was so intended. The Jekyll-Hyde allegation can be denied —few, if any, of the professors are jackals, and none that we know need hide for shame.

"A PROFESSOR."

Fundamental Principles Involved in Chicago System

To the Editor of the ELECTRICAL WORLD:

In the article on the Chicago system by Mr. LeClair and myself, which appeared in the June 15 issue of the ELECTRICAL WORLD, certain editorial additions were made to the block of "Fundamental Principles Involved" which were somewhat in error. The appended list contains the necessary corrections to create a more accurate impression.

1. The Chicago layout contemplates an indefinite expansion of generating capacity and an indefinite location of distributing station points.

2. The 66-kv. and 132-kv. transmission lines constitute a bus overlying the system—a bus to which generating stations and distributing stations are connected, supplying or receiving energy as occasion requires. There are no ties between these stations at generator voltage.

3. This high-voltage transmission line system is so designed that the capacity of step-down transformers at a generating or distributing station is a function of the amount of energy to be taken from or to this station and is independent of the number of high-voltage lines passing through.

4. In general, substations are radially fed at 12,000 volts (generator voltage) either from the power stations or from the distributing stations.

5. Fault currents are kept at a minimum by phase isolation, splitting the transmission buses into two parts and also by generous sectionalizing of the parts. Combined with the use of neutral resistors phase isolation reduces the short-circuit current to reasonably low values.

6. The fault bus system of protection is used with practically all isolated-phase bus structures whether in open-air, metal-clad or in masonry or steel cells. This system makes direct use of the ground current to remove the faulty member.

7. The general scheme is so arranged that a fault can put out of service only that limited part which is immediately affected by it. A fault does not dangerously disturb the functioning of the system as a whole.

8. At all generating stations or transmission terminals incoming and outgoing transmission lines terminate in buses at the line voltage.

9. All buses, at points where there is a large concentration of power, are capable of operation in sections in such a way as to minimize the effect of severe or prolonged short circuits.

10. Lines to a substation or to a group of substations are so separated at the generating station or distribution station as to reduce to a minimum the probability of a total interruption to the substation resulting from the loss of one unit of a station bus.

11. These schemes have permitted a reduction in the minimum time element of protective relays. Balanced relays are used in all cases where practicable.

R. F. SCHUCHARDT,
Electrical Engineer.
Commonwealth Edison Company,
Chicago, Ill.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Achensee Hydro Plant.—C. REINDL.—With the completion of the Achensee plant in northern Tyrol, Austria has finished its largest hydro-electric generating station with an installed capacity of 124,700 hp. and a yearly output of 165,000,000 kw.-hr. A 2½-mile long gallery, drilled through the bottom of a high mountain range, carries the water of a large Alpine lake, the Achen See, to the upper end of a single pipe penstock, leading down to the power house under about 45 deg. inclination, giving a hydraulic head of 1,200 ft. Along the side of the power house eight smaller pipes are branched off the main penstock for the supply of eight high-pressure Pelton wheels, connected directly to generators. Since the station serves for general electric supply and for railway, two distinct types of generators, 50 cycles, three phase and 16⅔ cycles, single phase, are installed. The characteristics of these machines are as follows: Three phase, two sets of 31,000-hp., 25,000-kva., 500-r.p.m., 50-cycle, 5,500-volt double Pelton wheels; two sets of 15,250 hp., 13,000-kva., 500-r.p.m., 50-cycle, 5,500-volt double Pelton wheels; single phase, four sets of 8,000-hp., 5,000-kva., 500-r.p.m., 16⅔-cycle, 5,500-volt single Pelton wheels. Transformers are provided to step the three-phase power to 115 kv. and the traction power to 55 kv. in an outdoor switching station. — *Elektrotechnische Zeitschrift*, May 23 and 30, 1929.

Generation, Control, Switching and Protection

Automatic Load Division Between Generators of Power Stations. — J. LEONPACHER.—Generators of different sizes operating in parallel on one common load will not share the burden proportionally to their size without manual control on each machine. Neither can two stations, tied into one system, participate on a common load without manual adjustment, in accordance with the obtaining demand. In most stations or systems, however, the daily load demand follows a regular and well-established schedule and, based upon this fact, the author has developed a unique method whereby the load division between machines or stations can be maintained automatically in accordance with schedule and most economic operation. For each generator is determined, by calculation, the amount of load which it is expected to furnish during a cycle of 24 hours. The diagram is drawn on cardboard, is cut out and placed around a cylinder, which is turned by clockwork once around in 24 hours. The cardboard profile acts as a cam to lift or lower a small roller, which turns an idler arm on the shaft of a megawatt meter, connected to the controlled generator. If the output of the machine is what it should be, operation is not interfered with. However, if it is less or more, a contact will be made between instrument pointer and idler arm at left or at right, adjusting the regulator of the prime mover in the proper sense. A remote-controlled pilot motor is used for this adjustment, located at the throttle of the turbine or the vanes of the water wheel. The same system can be used at the load dispatcher's office, in order to keep the output of two or more stations in accordance with a definite load program. — *Elektrotechnische Zeitschrift*, June 20, 1929.

Design and Construction of Large Turbo-Generators. — W. SHARP. — The author has undertaken a consideration of the trend and developments in large turbo-generator design and among the more interesting thoughts developed are the possibilities of a 250,000-kw. set, the use of aluminum for rotor windings and the replacing of air as a cooling medium. Performance characteristics of existing equipment have been considered in connection with the suggestions made by the author. — *Electrician (England)*, June 7, 1929.

Transmission, Substations and Distribution

Underground Super-Voltage Cables. —G. MARTINEZ.—An analysis based upon the total cost per mile of completely installed 33-kv. and 56-kv. underground cables for various spacings and types of lines, comparative costs of ordinary types and oil-filled types and an analysis of oil-filled cables for 33, 56, 132 and 220 kv. at different loadings and specified types of excavation. The author has also analyzed the advantages of the several systems of installation and of the various types of design and concludes that the oil-filled cable possesses definite and attention-deserving advantages under many conditions.—*Electrical Review (England)*, May 24, 1929.

Studies of Traveling Waves. — G. FRÜHAUF.—At the Dresden University an experimental high-tension line of about ½-mile length was erected, using standard re-enforced concrete towers and chain type four-disk insulator-suspended lines. The type of line is identical with a standard construction using four-disk chains. On this line traveling waves have been produced with 5.6-kv. initial voltage, arranging the four available wires in various connections, and measurements made with a Dufour oscillograph. Ten records are shown and discussed, showing in particular how the damping effect obtained checks well with calculated values. — *Elektrotechnische Zeitschrift*, June 20, 1929.

Motors and Control

Power-Factor Compensator.—In this article machines are described which are primarily intended for application to new or existing induction motors and are of the type known as a.c. exciters. They may be driven by an independent motor or coupled to the main motor by a direct drive or by belt. Their purpose is to generate an emf. at slip frequency and to impress this on the motor circuit of the main induction motor so as to correct the power factor of the rotor and consequently of the stator also. The special advantages of the power-factor compensator may be summarized as follows: The power factor of the main motor is practically constant over the working range and only a slight extra leading component is given at very light loads, the overload capacity of the main motor is somewhat increased, the efficiency of the whole equipment will generally be higher than that of an induction motor without a compensator, in most cases starting is performed in exactly the same way as with an induction motor, the power factor of the main motor at any particular load may be adjusted by means of the resistance in the field circuit, the addition of the compensating and commutation pole windings insures good commutation, no separate source of direct current is required for excitation purposes, and the power-factor compensator can if required give a leading power factor at full load, although the cost of the equipment is thereby increased.—*English Electric Journal (England)*, May, 1929.

Electrophysics, Electrochemistry and Batteries

Impulse Voltage.—SADATOSHI BEKKU and OSAMU NARASAKI.—In this investigation particular attention has been devoted to the discharge phenomena of the spark gap consisting of needle, sphere or disk electrodes. As a result of the determination it is reported that there is a critical gap length in the relation between the discharge voltage and the polarity of the needle which causes some irregularity or ambiguity of discharge and that if the gap length be greater than the critical gap length the ambiguity never takes place. It is also shown that the shape of the electrode and the polarity of the grounded terminal have a great effect on the ambiguity of discharge. Further tests with the cathode-ray oscillograph indicate that the differences depending upon the polarity of the needle may be clearly distinguished. A number of oscillo-

grams illustrating the determination secured in this investigation have been included, as have a number of characteristic wave forms for various conditions.—*No. 249 Researches of the Electrotechnical Laboratory (Japan).*

Applications of A.C. to Electrodeposition.—Electrolysis by means of superposed alternating current is described in this discussion, as is the method of securing the application of energy to the work. This process has been used for a number of purposes and the various effects which may be produced and which occur incidentally have been covered, as has a brief outline of the available information on this topic. It is stated that there is but one case of the technical use of superposed alternating current in electrolysis and that that was used in gold refining.—*Electrical Review (England),* July 5, 1929.

Traction

Electric Locomotives. — Symposium. —In an issue specially devoted to electric traction several papers are presented on latest types and developments of electric locomotives for main roads, emphasizing in particular the German railways, operating single-phase, 16⅔ cycles, 15,000 volts. It seems that the present trend is again in the direction of one motor for each driving axle instead of one or two large motors with jack shaft and rod drive. Accordingly, the latest models of German engines are of the type 1-Do-1 for express service and 1-Co + Co-1 for freight. The new designation of Do or Co is to indicate one motor for each of four or three axles, respectively. Large assembly drawings, showing every detail of the design of these two newest locomotives, are folded into the magazine. The Austrian railways has also adapted the multi-motor type and has in operation several units of the 1-Do-1 design. A special article is devoted to latest experiences in design of railway overhead construction for 15-kv. service.—*Zeitschrift des Vereines Deutscher Ingenieure,* May 18, 1929.

Automatic Over-Current Switch.—E. STUCHLY.—Up to the end of 1927, the Viennese elevated and subway trains carried an automatic over-current protection, which operated indirectly; that is, when the car current rose beyond a certain value, a maximum relay cut the control circuit to the pneumatic contactors, which caused the discharge of compressed air in the cylinders, which in turn dropped their pistons, interrupting finally the over-current. The total time thus consumed from the instant the over-current sets in until it is cut is 0.08 second, which was found much too long. A new type of direct-acting switch was therefore developed, which was found to open in 0.02 second. The switch opens by the rotary action of an arrowhead-shaped copper block between two stationary horn electrodes.—*Elektrotechnik und Maschinenbau,* May 19, 1929.

Telegraphy, Telephony, Radio and Signals

Multi-Telegraphy with Tone Frequency.—W. SCHEPPMANN.—The usefulness of a telegraph line can be greatly enhanced if arrangements are made to transmit several messages simultaneously over one pair of wires. This can be done by sending each of the messages with a different alternating-current frequency and resolving them at the receiving end by selective apparatus. A system is described whereby a small special generator furnishes ten different frequencies between 375 and 1,725 cycles, each 150 cycles above the next. The output of each frequency band is 5 watts, which is sufficient to operate several systems. It is claimed that such a machine sender has decided advantages over a system in which the various frequencies are produced by vacuum tubes, among other advantages being the absolute steadiness of the alternating-current and the instant stand-by, requiring no previous tuning. Apparatus and connection diagram for a set of seven simultaneous messages are shown. — *Elektrotechnische Zeitschrift,* June 6, 1929.

Miscellaneous

Wire Joints.—E. MAREC.—A splice between two wires or a joint from a throughgoing wire to a branch wire should not only be perfect from the electrical standpoint but should also have a mechanical strength at least equal to that of the solid wire. Data on the electrical resistance of various kinds of joints have been published frequently, but few investigators have tested the rupturing strength of joints. The present article deals with this subject and describes tests made on twisted, soldered, pinched and clamped joints, made on solid wires and cables of up to 38 sq.mm. cross-section, such as used on low-tension distributing networks. A properly made wire joint should stay electrically cooler and should have a mechanical rupturing strength superior to the solid wire.—*Revue Générale de l'Electricité,* May 25, 1929.

Book Reviews

Die Stromwendung grosser Gleichstrommaschinen

By Dr. Ing. Ludwig Dreyfus. Berlin: Julius Springer. 191 pages, 101 illustrations.

The book is primarily for the designer of direct-current machines. The author contends that research in the theory of commutation has been neglected during recent decades. Approximations serviceable for smaller machines may not be adequate when the currents become very great. Writing as head of the research staff of a large Swedish manufacturing organization, he is presumably concerned with generators for electrolytic service, with enormous currents at relatively low voltage. He therefore sets out to investigate the whole subject anew, taking account of the various component fields and their variation, with the object, he states, not of insisting on some specific theoretical point of view but of devising an approach to the practical computations required.

Centrales Électriques

By F. Drouin. Paris: Librarie J.-B. Baillière et Fils. 602 pages, 242 illustrations.

Under the directorship of A. Blondel, successive volumes are being issued of an Encyclopedia of Industrial Electricity. The present publication is one of these. The author holds responsible technical and educational positions. The book constitutes a convenient reference work on ordinary steam central-station practice, avoiding consideration of extremes both of design and of size, which would have made it unduly bulky. Without going into technical complexities to any great extent or delving deeply into theoretical considerations it takes up in detail the numerous elements constituting the plant, grouped under several heads, such as the selection of a site, water, fuel, heat engines, piping, electrical machinery, switchboards, operation. Large pages and close type have made possible a connected, easily readable assembly of much material, including tabulated data.

Geschichtliche Einzeldarstellungen aus der Elektrotechnik

Band I. Herausgegeben vom Elektrotechnischen Verein E. V. Berlin: Julius Springer. 99 pages, 99 illustrations.

Original sources for tracing the development of electrical engineering, intermingled in the great accumulation of technical papers of more than a generation, are often inaccessible. The Elektrotechnische Verein has undertaken the publication of a series of historically important papers assembled from the periodical literature of the past. The little volume under review presents the first group.

The titles of the five contributions, with the dates of their original publication, are: The history of the transformer, by L. Schüler (new; references are cited back to 1835); on alternating-current transformers, with special reference to the best ratio between iron and copper, by Gisbert Kapp (1888); on the efficiency of transformers, by Dolivo-Dobrowolsky (1892); on the predetermination of the voltage drop in transformers, by Kapp (1895); history of electric meters, by Stumpner (1926, with early references).

News of the Industry

Death of Thomas E. Murray

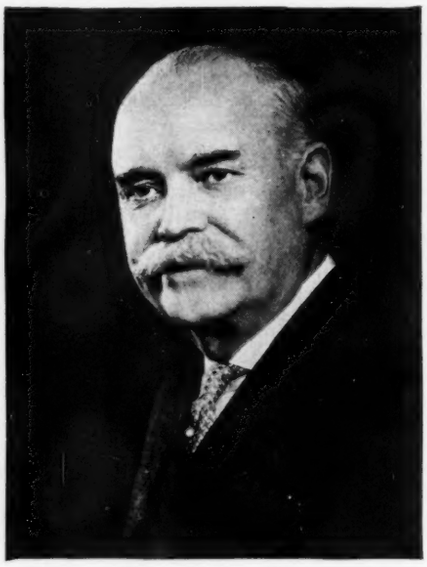
Well-Known Inventor, Engineer and Light and Power Executive, Former Vice-President of New York Edison Company, Passes in Sixty-ninth Year

BY THE death of Thomas Edward Murray at his summer home in Southampton, Long Island, N. Y., on Sunday morning, July 21, there was removed from the ranks of the electrical industry a distinguished inventor, to whom, it is said, more patents were granted than to any other man save Thomas A. Edison; an engineer of large achievement, and a light and power company executive who had much to do with the growth and success of the New York Edison Company and the United Electric Light & Power Company, its close ally. As a builder of power plants also Mr. Murray had a record of unusual activity and accomplishment.

To his skill as a builder are due in great measure not only the famous plants of Greater New York—Waterside No. 1 and No. 2, Sherman Creek, Hell Gate, Gold Street, Hudson Avenue, East River and the Williamsburg street-railway power houses—but also steam plants in Albany, Utica, Rochester and elsewhere in New York and in Dayton, Ohio, and hydro-electric plants at Chattanooga, Tenn., and Cohoes and Trenton Falls, N. Y. Over the design of all these and various smaller generating stations he had supervision. His total installation of 2,168,380 kw. is probably larger than that of any other man in the industry. He built also the new headquarters building of the Consolidated Gas Company and its subsidiaries at Fifteenth Street and Irving Place, Manhattan Borough.

Mr. Murray was born at Albany, N. Y., October 21, 1860. At an early age he entered an apprenticeship as a mechanic in Albany. He made rapid progress and his ability became generally recognized, so much so in fact that at the age of twenty-one he became engineer of the city waterworks. It was about six years later that the late Anthony N. Brady launched the Albany Electric Light Company and Mr. Murray was chosen chief engineer, advancing to superintendent and finally general manager. During this period he also acted for a number of years as consulting engineer for the Albany Street Railway Company and the railway and electric lighting properties in Troy.

In 1898 Mr. Brady brought Mr. Murray to New York to effect the physical merger of the electric lighting systems in Brooklyn, and shortly afterward Mr. Brady also intrusted to him the task of consolidating the electric lighting properties in Manhattan into the New York Edison Company, of which property Mr. Murray became second vice-president and general manager. He was senior vice-president at the time of the merger last year taking in the Brooklyn Edison Company, when he became vice-chairman of the board. He had also been president of the Yonkers Electric Light & Power Company and vice-president of the United Electric Light & Power Company. He



Thomas E. Murray

founded the Metropolitan Engineering Company as well as the consulting engineering firm of Thomas E. Murray, Inc.

In the midst of these activities Mr. Murray found time to patent hundreds of inventions, a large proportion of these being electric protective devices for the manufacture of which the Metropolitan Engineering Company was established. In recognition of his work in this field the Longsworth medal was awarded to Mr. Murray in 1910 by the Franklin Institute, and in 1913 he received the gold medal of the American Museum of Safety.

In his more recent years Mr. Murray gave considerable attention to electric welding and obtained a large number of patents covering his work in this field. Other devices covered by his patents cover such varied lines as steam boilers, the water-wall furnace for steam boilers, which has revolutionized boiler design; copper radiators, high-tension electric switches and fuses, electric protective devices, cinder-catching device for eliminating nuisance from stacks, automatic stoking device, pulverized-fuel equipment, refrigerating machines, reactance coils, concrete duct systems, electrically welded valves, fittings and pipe joints, coal hoppers, hydro-electric elevators, steel-plate flywheels, trench motor shells, axle housings and household appliances.

Mr. Murray for two years was president of the Association of Edison Illuminating Companies. Among the many honors he received were the honorary degrees of doctor of science, conferred on him by Villanova College, Pennsylvania, and doctor of laws by Brooklyn College. He was a member of the A.I.E.E. and other electrical and engineering associations.

Many tributes were paid to Mr. Murray's memory by his friends and associates. In private life Mr. Murray was known for his earnest attachment to and service in the Roman Catholic Church, from which he had received high lay honors. Funeral services at St. Gregory's Church, Brooklyn, on Wednesday morning were very largely attended, many men prominent in public life as well as leaders of industry being present. Eight children survive him.

Mohawk-Hudson Company Plans New Hudson Plant

All water-power rights now owned by the Union Bag & Paper Corporation on the Hudson River near Hudson Falls, N. Y., will soon be controlled by the Mohawk-Hudson Power Corporation, according to a statement attributed to C. S. Ruffner, president of the New York Power & Light Corporation.

The Union Bag & Paper Corporation site at Hudson Falls is the last of the major power sites on the Upper Hudson that has not been developed to capacity. It is reported that the amount involved in the purchase and construction will exceed $10,000,000 and that a hydro-electric station will be built a short distance below the Moreau power station of the Union Bag & Paper Corporation, on the west shore of the Hudson River near Fenimore.

It is thought probable that the development will be modeled after the plans which were made over three years ago by the Union Bag & Paper Company, which planned the construction of a six-million-dollar plant. The new development may be similar to the plant at Spier Falls, but the head will be 85 ft., more than double that of the latter, which is 30 ft. The new station will develop 75,000 hp.

New Power Development for Industrial Chicago

Industrial Power Corporation Organized to Furnish Electricity, Gas and Steam for Industrial Use in That City—Future Plans Embrace Six States

ANNOUNCEMENT was made on July 23 of the organization by Boston, New York and Chicago interests of the Industrial Power Corporation, which has been incorporated under the laws of Delaware for the processing of coal and the furnishing of electrical energy, gas and steam to the industrial manufacturing district of Chicago, including Packingtown, the central manufacturing district, the Union Stock Yards and the entire industrial area adjacent to this manufacturing district. The new company has been privately financed for $10,000,000 of 6 per cent preferred stock with 200,000 shares common stock of no par value. Robert A. Fairbairn will be elected president by the directors.

The physical properties of the new company will include a central-station power plant, having approximately 100,000 kw. capacity and designed for an ultimate steam plant of twelve 2,500-hp. high-pressure boilers. The fuel for this station will be obtained from a coal-processing plant in which all of the fuel used in the new development will be treated by low-temperature carbonization, thus making it possible to furnish ultimately 45,000,000 cu.ft. of gas daily to the industrial area adjacent to the property. Contracts have been entered into for the sale of tar, light oils and motor spirits, so that a ready market is assured for all of the products of the carbonizing process.

The new company has acquired outright the Produce Terminal Corporation, an Illinois utility, which has been in successful operation for many years, but which because of the inadequacy of the plant has been able to furnish only a limited amount of electric power and steam for processing to the plants in the stock yards district. The properties and contracts of the Produce Terminal Corporation accrue to the new company.

Easements along the entire lines of the Chicago Junction Railway are included in the assets of the new company. These easements provide immediate access to 25 of the 26 railways entering Chicago. The likelihood of early electrification of railroads entering the metropolitan area gives significance to the acquisition of these easements.

Stevens & Wood, utility engineers, are at present completing the survey of the properties to be served by the new development and are preparing plans for the new central station and the low-temperature carbonization plant, with the necessary provisions for combining the properties into a self-maintained system. Work on the new plants will be started at once and the present schedule provides for delivering service to the Chicago industrial area early in 1930.

The Industrial Power Corporation has secured exclusive state rights in Illinois, Indiana, Minnesota, Missouri, Michigan and Wisconsin to certain processes for the low-temperature carbonization of coal, and it is anticipated that the activities of this company will be extended in the near future beyond the area immediately included in the initial development.

Roosevelt to Present Definite Plans for St. Lawrence

After a tour of inspection embracing the site of the proposed international power dam at Barnhart Island in the St. Lawrence River, Governor Franklin D. Roosevelt of New York State said on Wednesday night that he would present definite plans to the Legislature at its next session for this development.

The magnitude of the plan, as well as its extreme importance, was emphasized by the Governor informally. At several points along his automobile route in the northern counties he told the crowds which gathered that he was extremely interested in that part of the state, which he termed the focal point in matters of state policy. "I hope," he said at one stop, "that a Republican Legislature and a Democratic Governor can get together during the winter on a plan to develop this power site for the benefit of the whole state."

Revolutionary Wiring Change Proposed

Prof. Edward Bennett Tells Wisconsin Electric Section He Would Utilize Conduit Itself for Third Wire—Rural Service and Inductive Co-ordination Discussed

A PROPOSED revolutionary change in wiring, which, it was said, will save people of this country in excess of $4,000,000 each year, was one of the most important matters discussed at the Electric Section convention of the Wisconsin Utilities Association held at Wausau, Wis., July 18 and 19. Edward Bennett, professor of electrical engineering at the University of Wisconsin, announced that he has developed a substitute for the present three-wire system of distribution, substituting the steel conduit itself for one of the three wires. The first application of Professor Bennett's discovery will be made in the wiring system of the Mechanical Engineering Building at Madison.

Professor Bennett said that the great advantage of his proposed system is that the cost in conduit and wire will be approximately 20 per cent less than for the three-wire system. Reduction in labor costs, he said, will amount to approximately 15 per cent. Electrical loss will be substantially less than for the average building as now equipped, utilizing one copper wire to complete the circuit, but enclosing it in the steel conduit for mechnical protection.

The convention was held in conjunction with Wausau's "Light's Golden Jubilee" celebration. Special sound films of the N.E.L.A. convention and talking pictures of N.E.L.A. convention speakers were shown.

Tom C. Polk. executive secretary of the Great Lakes Division of the N.E.L.A., praised the state and national associations as responsible for the fact that today the American people are "electrically minded."

Steps in the advance of rural electrification were described by E. R. Meacham of the Wisconsin Power & Light Company. The gradual but definite tendency toward general uniformity of the conditions under which farmers throughout the state may obtain service is most encouraging, he maintained. Farmers in Wisconsin are using about four times more electric service on the average than they used five years ago and are already employing electrical energy individually to a greater extent than the average city customer.

H. R. Huntley of the Wisconsin Telephone Company discussed some of the important factors which affect inductive co-ordination of power lines and telephone lines. His talk was accompanied by a demonstration which illustrated many of the points discussed, the apparatus used consisting of a miniature three-phase power line and a miniature telephone line.

E. H. Finkelnburg of the Mississippi Valley Public Service Company reported on radio interference and equipment to eliminate it; A. F. Frahm of the Northern States Power Company, retiring chairman of the section, discussed the radical utility measures now before the Wisconsin Senate; T. A. Brown of the Madison Gas & Electric Company reported for the underground system committee, and President G. W. Van Derzee of the Wisconsin Utilities Association defended proper publicity methods, saying that opposition to them came from men ignorant of what they were designed to teach.

A. L. Pond, as chairman of a special historical committee, reported that Henry Ford has definitely decided to reproduce the world's first commercial water-power plant, which was that installed at Appleton, Wis., in 1882, for permanent exhibition in the Ford Museum at Dearborn.

D. G. Evans of the Wisconsin Gas & Electric Company, Racine, who was vice-chairman of the section last year, was elected chairman. The new vice-chairman is E. J. Kallevang of the Wisconsin Power & Light Company, Madison.

Washington Canvasses Bond & Share Case

Important Point Left Undecided—Views Expressed by J. T. Newcomb and Former Commissioner A. F. Myers —No Certainty of an Appeal.

By Paul Wooton
Washington Correspondent for the Electrical World

WHILE the decision in the Electric Bond & Share case admittedly overruies the contention of the company with regard to the authority of the commission to issue personal subpœnas, it is contended by those interested in the company's side of the case that the really important point involved was not decided. The ruling is based on the assumption that the Electric Bond & Share Company is engaged to some extent in interstate commerce. Since the company is convinced that there is nothing to justify this assumption, utility interests feel that little of real importance in this action has been determined.

In interpreting the decision, J. T. Newcomb, counsel for the Joint Committee of National Utility Associations, holds that under this ruling the Federal Trade Commission may not, by subpœna duces tecum or otherwise, demand the inspection of books as was insisted upon by the commission.

"The main point of general interest in the case," says Mr. Newcomb, "is whether or not a holding company owning shares of stock in an operating company which does in part engage in interstate business is itself subject to regulation under the commerce clause of the Constitution. This question is not decided, but a way is opened to secure a ruling on it without resorting to appeal.

"In overruling the objection to the personal subpœna Judge Knox states that he is assuming that the Electric Bond & Share Company is engaged in interstate commerce, but declares this to be an assumption only, which may be tested if either side desires a ruling on the question. He suggests the appointment of a master to report to the court on that question and states that he will appoint such a master on the application of either party."

From another viewpoint it is pointed out that the Federal Trade Commission is very anxious to establish its right to issue subpœnas under subdivisions A and D of Section 6 of the Federal Trade Commission act. In this respect, at least, the decision is particularly gratifying to the commission. Judge Knox admits in his decision that a volume easily could be written on that point, but says he is not willing to deny the commission this right..

The broad question of whether the business of holding and operating companies is in the legal sense interstate commerce was not subject to the judge's opinion, it is claimed by those interested in the commission's side of the case, inasmuch as the decision was based on complaint and response without taking of evidence. An offer of proof was tendered by the commission, opposed by the company and rejected by the court. Judge Knox started by assuming that an essential part of the Electric Bond & Share Company's business is interstate commerce and that the commission therefore has power to compel the personal attendance and testimony of witnesses concerning subjects within the investigation. This power is not limited to the formal complaint but apparently extends to any line of questioning within the commission's right to proceed against anti-trust violations, although Judge Knox warns against abuse of this privilege.

It is contended further that if the commission through its power to question witnesses and with its investigators working in company offices throughout the nation concludes that guilt anywhere exists, it would, as the decision now stands, be possible to establish probable cause as a basis for seizing books and papers.

No course of action has been announced officially by either side. In the absence of the members of the commission and the chief counsel no press announcements have been released subject to quotation. With the present commissioners away, former Chairman Abram F. Myers, who has followed the situation closely, consented to give his opinion on the matter as follows:

"The decision by Judge Knox settles a dispute which long existed as to whether the commission had authority to issue process under its general powers of investigation or whether such authority was confined to cases in which a complaint had been issued for a specific violation of law. It is gratifying to learn that this jurist considers the commission to possess the power which Congress plainly intended it should have, namely, to compel testimony as to the interstate operations of corporations prior to the issuance of a formal complaint. In this decision the commission is decidedly the gainer and its policy in the conduct of economic investigations is vindicated.

"Of course, the commission has no power to inquire into matters which are not interstate in character unless there is evidence that such operations have a direct bearing on interstate commerce. In his ruling on the demand for the operating expense ledger, Judge Knox gave expression to the settled law, leaving it open to the commission to establish the competency of the books as evidence. This was in no sense a limitation of the commission's powers of investigation, but rather a judicial intimation as to how these powers can properly be employed."

Electric Bond & Share Wins Point

Federal Court in New York City Denies Power of Federal Trade Commission to Force Production of Books and Records, but Says Officials Must Testify

PARTIAL victory, at least, appears to have come to the Electric Bond & Share Company in the legal proceedings by which the Federal Trade Commission sought to force that company to produce certain books and records as pertinent to the investigation the federal body is making into the electric and gas utilities. The commission's application for a court order requiring officers and employees of the company to comply with the demand for these records was denied on July 18 in the United States District Court, New York City, by Judge John C. Knox, who held that the commission had not proved the reasonableness of its demand.

In his decision Judge Knox said that it would be assumed that the company, as a part of its business, was engaged in interstate commerce, which would bring it within the provisions of the Federal Trade Commission act of September 26, 1924. He did not undertake to settle that point, but offered to refer it to a master. Congress, he observed, in any event has not undertaken to regulate the interstate carriers of electricity in the same manner as interstate common carriers. The decision said:

Until the powers of the petitioner with respect to such inquiries as it may undertake shall have been enlarged by appropriate statutes the present limitations which hedge about its inquisitorial functions must be recognized. One of them is that until particular documents, including books, become evidentiary, respondent corporation is not obliged to lay before the commission its books and papers for scrutiny.

The decision held that, so far as shown by the papers, the books and vouchers sought relate not alone to interstate business of the company, but also to its intrastate business, and "that even as to interstate business, petitioner cannot say to a suspected corporation, 'Stand and deliver the possible evidence of the crime of which you are suspected." It continued:

A time may come when the petitioner will have established the reasonableness of a demand for particular papers or books from the company, but it does not appear to have arrived. So far the suggestion that the corporation may perhaps have violated the anti-trust laws rests only on hearsay and suspicion.

In upholding the right of the commission to summon witnesses, Judge Knox held in part:

The point which respondents thus seek to establish is so enshrouded by the mists of legislative arguments, prior decisions and present controversies that a volume might easily be written in an effort to disperse them. But I have neither the time nor disposition to do so. By way of brief response to the point advanced by respond-

ents, it may be said that the commission's declared power to require by subpœna the attendance and testimony of witnesses and the production of documentary evidence relating to a matter properly under "investigation" is an illusion unless it comprehends investigations such as are contemplated by subdivisions of Section 6 of the act.

So far as I can see, there was no constitutional barrier to the grant to the commission of the power to use compulsory process in its lawful investigations. Petitioner, of course, must not abuse the process, but with this restriction I am satisfied that it can be used in an "investigation" which has not ripened into a proceeding under Section 5 of that act.

Respondents' objections to the subpœnas duces tecum will be sustained, and those that were interposed to the pertinent and competent questions propounded to the individual witnesses will be overruled.

Purchases and Mergers

Attleboro Steam & Electric Company Will Go to New England Power—Other Transactions in New England, South and Middle West

CERTIFICATES representing more than 60 per cent of the outstanding stock of the Attleboro (Mass.) Steam & Electric Company have been deposited for sale to the New England Power Association in acceptance of the offer reported in the ELECTRICAL WORLD for July 13 (page 79). This insures the acquisition of the Attleboro company by New England Power.

The New England Public Service Company has obtained control of the Bates Manufacturing Company of Lewiston, Me., according to press reports, through an offer made by Tucker, Anthony & Company on behalf of the Insull group, which already controls a number of textile mills in Maine. It is understood that the interest in these companies is due to the water-power sites owned, though a desire to aid the textile industry is also thought to be a motive.

The New Hampshire Public Service Commission has authorized the consolidation of the Baker River Light & Power Company and the West Campton Light & Power Company with the Plymouth (N. H.) Electric Light Company. The merged companies will operate as the Pemigewassett Electric Company, which will continue to serve the territories of the consolidated companies as a public utility.

The Freedom Electric & Power Association of New Hampshire has been authorized by the New Hampsh re Public Service Commission to transfer its interests to the Freedom Electric Company. The latter will operate as a public utility, and the Public Service Company of New Hampshire will purchase 200 shares of the company's stock for $9,000.

Control of the 11,000-volt power line between Rochester and Sodus, N. Y., which for several years has fed the Wolcott (N. Y.) Lighting Company, has been taken over by the Lake Ontario Power Corporation.

An order issued by the Illinois Commerce Commission last week authorized the Illinois Light & Power Corporation to purchase the Henderson County Public Service Company for $100,000.

Purchase of the Northwestern Light & Power Company at Mayville, Wis., has been completed by the Wisconsin Power & Light Company, which will rehabilitate the generating plant, closed for some time.

Voters of Dow City, Iowa, will vote on August 8 on a proposal to sell the local electric plant to the Iowa Public Service Company. Should the vote be favorable, lines will be extended from Charter Oak and Arion.

The City Council of Hoxie, Kan., has asked the Kansas Public Service Commission to approve the sale of its lighting plant and distribution system to the Central Kansas Power Company.

The Town Board of Greeley, Neb., has voted to sell its distribution system and transmission lines to the Western Power Company of Boston for $51,000. The plant was shut down three years ago, power being brought in from Cedar Rapids, Neb.

Approval of the acquisition by the Alabama Power Company of the Alabama Water Service Company's electric utilities in a number of towns (see ELECTRICAL WORLD for July 13, page 79) has been granted by the Public Service Commission of the state.

On August 1 the Louisiana Power & Light Company will take over the municipal power plant at Donaldsonville, La., recently purchased and extend service into the neighborhood.

The voters of Kamloops, B. C., have defeated the proposal to sell the city's electric plants and distribution system to the Canadian Waterworks & Electric Company, Vancouver, for $800,000.

Shannon Hydro-Electric Plant Is Dedicated

Cable dispatches from Ireland tell of the formal dedication of the hydro-electric power plant which has been under construction on the River Shannon for three years. President Cosgrave of the Irish Free State and other government officials journeyed to Limerick on Tuesday, July 23, when the gates of the intake structure were opened with appropriate ceremonies, thus bringing the undertaking to the beginning of the final stage. The plant, which is expected to give a great impulse to Irish industry and the domestic use of electricity, is being built by German engineers, though credit for its conception and realization belongs largely to Dr. T. A. McLaughlin, managing director of the Irish Free State Electricity Supply Board. It was designed for an ultimate development of 450,000 hp., at a cost of $26,000,000. The initial installation is 90,000 hp.

Coming Institute Meetings

The Pacific Coast meeting of the American Institute of Electrical Engineers, to be held at Santa Monica, Calif., September 3-6, will be followed by a district meeting at Chicago on December 2-4. Meetings for 1930 already arranged include the annual winter convention at New York, January 27-31; the annual summer convention, to be held next year at Toronto, June 23-27, and a district meeting at Springfield, Mass., May 7-10.

Chattahoochee River Still Awaits Decision

Indications that Federal Power Commission Will Award Permit to Lanier Interests — Conflicting Applications for Current River, Mo.—Cumberland Falls Agitation

A DRAFT of a preliminary permit covering a proposed power development on the Chattahoochee River above West Point, Ga., has been forwarded to J. Smith Lanier and associates for acceptance. The project as outlined in this draft of the permit includes the provisions sought by West Point and Lanett, Ala., intended to reduce the magnitude and destructive character of floods at those towns. This action on the part of the commission indicates that a conflicting application of the Columbus (Ga.) Electric & Power Company for a similar project, without provisions for flood control, will be rejected by the commission, although no announcement to that effect has been forthcoming. It is planned to develop 40,000 hp.

The Doniphan (Mo.) Hydro-Electric Company has applied to the Federal Power Commission for a license covering a proposed 48,000-hp. development on the Current River in Ripley and Carter Counties, Mo. It is planned that the plant shall operate under a head of 100 ft. and that the reservoir cover 33,000 acres. Soon after the receipt of the application from the Doniphan company the Current River Power Company filed a conflicting application for a preliminary permit. The latter company proposes to build three dams. One is to be 6½ miles north of Doniphan, creating a head of 84 ft.; the second dam is to be just below the mouth of Mill Creek, with a head of 110 ft., while the third dam is just below the mouth of Blair's Creek and has a head of 100 ft. At the three sites it is expected that 33,000 hp. of primary power can be developed.

The Public Service Company of Colorado has applied for a license covering its constructed Barker and Kossler reservoirs, 63,000 ft. of pipe line and the transmission lines in the vicinity of Nederland and Boulder.

The Southern Sierras Power Company has applied for a license covering 24 miles of 33,000-volt transmission line to connect Banning and Palm Springs in Riverside County, Calif.

Attorneys representing the officials of ten Kentucky counties have filed a brief with the commission urging that in the public interest a license be issued for the development of Cumberland Falls. The development, the brief says, "brings to the state and section the divine plan of giving the greatest good to the greatest number of people." After reciting the practical arguments for a power plant as against a scenery preserve, the point is stressed that "Cumberland Falls is now inaccessible, but this development makes accessible not only the falls but the entire Cumberland River gorge, which is in many respects more scenic than the falls themselves."

Lehigh Valley Gets Bids for Electrification

Three Manufacturing Companies Competing for the Task of Converting 75 Miles of Main Line Between Mauch Chunk and Wilkes-Barre.

BIDS from the Westinghouse Electric & Manufacturing Company and the General Electric Company for the electrification of 75 miles of the Lehigh Valley Railroad's main line between Mauch Chunk and Wilkes-Barre, Pa., have been submitted, and the American Brown Boveri Company is also figuring on the contract, which, it is estimated, will cost between $7,000,000 and $10,000,000.

The three electrical companies recently completed surveys of the region which it is proposed to electrify. G. H. Foster, vice-president of the Lehigh Valley, and his staff are now examining the figures of the General Electric and Westinghouse organizations with a view to comparing the cost of operation under an electrical system with the cost as it is under steam operation. One question to be determined is whether direct or alternating current shall be used if electrification is determined upon.

The section of the Lehigh Valley which it is proposed to electrify runs through mountain territory, and freight trains are moved over it with three-cylinder locomotives. Trains change engines at each end of this operating division under steam operation, and the substitution of electricity for steam on this section would not involve more stops than are made now.

Representatives of the electrical companies have told Mr. Foster that the use of electricity on this division would make possible the movement of more and longer trains at greater speed than is possible with steam. They have also submitted figures to show that the maintenance of electric locomotives would be considerably below the same charges for steam equipment. The Lehigh Valley is making a close study to determine whether the use of present or even more powerful steam equipment would enable the road to continue its present schedules without making a large capital outlay for electrical equipment.

Another 75,000-Kw. Station for Buffalo

The Buffalo General Electric Company will build another steam-electric generating station, adjacent to its Huntley station, on the Niagara River, in the early fall, William R. Huntley, president, announces. The new turbo-generator will have a rating of 75,000-kw. Three boilers, to operate at 425 lb. pressure and 750 deg. temperature, will be installed, with room for a fourth, and the building will be large enough to install an additional 75,000-kw. generating unit later.

"Even with the pooling of the power resources of three systems in the Niagara-Hudson Power Corporation, there is not enough power to meet the demands which we estimate will be made in the next few years," Mr. Huntley said, in alluding to the impossibility of getting more power from Niagara Falls at this time. "In this business we must look ahead."

Barnes Speaks at Amsterdam for Private Ownership

To Julius H. Barnes, former president of the United States Chamber of Commerce, fell the lot of presenting on July 12 before the International Chamber of Congress, in session at Amsterdam, Holland, the American viewpoint concerning private and public ownership and operation of business enterprises. In the course of Mr. Barnes' address, which was followed with much interest, he said:

In the field of public utilities for light and power service there is the same record of extraordinary efficiency in development and in administration. A vast interconnecting network reservoir of electric power, both coal-generated and hydro-generated, has resulted in distributing peak loads so economically as to reflect in lowered charges, rates being now lower than the pre-war basis.

Governments may imitate the practices of private enterprise and here and there may occasionally register some advance, but in the great fields of transportation, communication and electric utilities the significant accomplishments are in overwhelming measure the product of private enterprise. These three monopolistic public services are regulated by public bodies protecting the public interest through continuous and flexible control of charges and practices, always subject to appeal through the established courts as high as the national Supreme Court itself.

In the light of the enormous expansion of all industry resting on these three basic facilities and in the light of the steady rise in average living standards of all our people, there are few indeed in America who do not today realize that it is more important to have adequate and efficient service than it is to force an unwisely low level of charges that might check expansion and improvement. The policy of public regulation instead of public operation has justified itself a thousandfold in these services themselves, while the benefit of such services can be clearly indicated in the expansion and growth of all industry.

At the close of the discussion the congress, by resolution, declared that "private initiative and private operation of enterprise constitute the most effective instrument to assure the progress of industry and to increase general prosperity." To the formal resolution the American delegation added this comment:

In increasing productivity, advancing living standards and developing the most widespread prosperity, the American delegation has been asked to outline the steps that have led to the most significant results of modern industry in American experience. We find it due to the following factors:

1. Machinery aiding the worker and supplied by large capital ventures, making each worker more efficient.
2. Increased wages and reasonable hours, increasing the value of that productivity by increasing the worker's buying power.
3. Ownership of the industries in part by the workers by means of stock investments, giving the workers a financial interest in the prosperity of the company.
4. Capital flowing in freely, unafraid of any possible government competition.

Blame Asphyxiations on Gas from Refrigerators

Chicago Authorities Will Take Action in Co-operation with Manufacturers and Distributors to Prevent Any Further Fatalities from This Cause.

EXCITEMENT has been caused in Chicago and has had echoes in other places because of the attribution of a dozen or more deaths from asphyxiation in the city named to the escape of methyl chloride from the high-pressure refrigerating systems of apartment houses. The health commissioner and the City Council became active after the death from this cause of a man, his wife and their child was reported last week. Their efforts are being supported by the manufacturers and distributors of electric refrigerators, who are conferring with members of the Council on a proposed ordinance, of which the following is the principal clause:

"Permits issued for the installation and maintenance of refrigeration systems and certificates of approval issued for such systems shall state the amount, composition or constituents of the refrigerant used. All poisonous or toxic refrigerants used in any direct system of refrigeration shall have a distinct and easily recognizable odor or characteristic irritant properties. Every refrigerant used must be approved as to the aforesaid properties by the commissioner of health."

This clause, if passed, would automatically stop the use of methyl chloride, the colorless and odorless gas which has been blamed for all of the recent deaths in Chicago.

Representatives of the electric refrigerator industry have formed a committee of which R. Bourke Corcoran, manager of the Electric Association, Chicago, is chairman. The Copeland Products, Servel, General Electric, Peerless, Ideal Refrigerator, Kelvinator, Frigidaire and Brunswick Kroeschell companies are represented.

R. W. Kritzer, vice-president of the Peerless Ice Machine Company, after the inquest into the most recent deaths, ordered all methyl chloride removed from machines installed by his concern. He said: "Practically all of the manufacturers and distributors in the city who put out refrigerators using methyl chloride have decided to take that gas out of the machines in operation and substitute another gas. The majority of them decided to substitute sulphur dioxide for the methyl chloride. It has a sharp, pungent odor, which methyl lacks, and it can be depended upon to warn people by its odor if it starts to escape. It can be depended upon to wake them up if they are asleep."

Briefer News

OKLAHOMA GAS & ELECTRIC STILL EXPANDING.—The Oklahoma Gas & Electric Company has begun construction of new equipment at Shattuck. An 1,110-hp. Diesel engine will be installed and transmission-line extensions made to Sharon and Vici.

KANSAS POWER & LIGHT TO BUILD HYDRO PLANT AT MARYSVILLE.—Coming construction of a hydro-electric power plant at Marysville, Kan., at a cost of more than $200,000, by the Kansas Power & Light Company through the associated Blue River Power Company, is announced. A dam which is located at flour mills north of the city will be the site.

POWER COMPANY OFFICIALS INSPECT DAM SITE FROM THE AIR.—A group of Union Electric Light & Power Company officials, including President Louis H. Egan, together with representatives of Stone & Webster, engineers for the dam and hydro-electric power plant to be constructed by the Union Electric company on the Osage River near Bagnell, Mo., made an aërial inspection of the dam site on July 19.

PROGRESS ON POWERTON PLANT.—The second 52,500-kw. turbo-generator at the Powerton plant of the Super-Power Company of Illinois is so far advanced that work on the third unit is starting, equipment and material for it having been shipped to the plant. This power house, near Pekin, Ill., serves four Insull companies—the Commonwealth Edison, Public Service of Northern Illinois, Illinois Power & Light and Central Illinois Public Service.

NEW YORK STATE WATER POWER COMMISSION BOOSTS RATES ON POWER RIGHTS.—An increase of the rate charged by the State of New York for water-power rights on state waters from 75 cents to $5 per horsepower-year has been made by the State Water Power Commission by a vote of two against one, Attorney-General Ward opposing the increase. The new rate was fixed in Albany on the application of the Niagara Falls Power Company for use of an additional flow of 500 sec.-ft. This rate, which, if applied to all the state waters affected, would bring in a large public revenue at the expense of the power companies, may be contested in the courts.

ALUMINUM COMPANY MAY START NEW HYDRO DEVELOPMENT.—Activity of high officials of the Aluminum Company of America brings reports from North Carolina that the company, owner of power rights on the Little Tennessee River and its tributaries in the Nantahala section of that state, is about to proceed with the construction of the large power development announced two years ago. Development of the project, which is in an isolated mountain section, would necessitate the abandonment of the Fontana branch of the Southern Railway and the relocation of its main line for a dozen miles or more. It was indicated when the project was first announced that it would cost approximately $15,000,000. Three big dams were projected which would fill the Nantahala gorge with water, creating a large lake. Power rights were bought before the Federal Power Commission was created, and it is maintained that no permit will be necessary for the construction.

TWO COLORADO COMPANIES EXPAND.—The Commonwealth Utilities Corporation of Denver has asked the Public Utilities Commission for the right to operate an electric transmission line from Colorado Springs to Castle Rock and to serve Palmer Lake, Monument and Larkspur, which are on the route. The Rocky Mountain Utilities Company asks for permission to supply Hugo, Flagler and Bovina with electricity. It is seeking franchise grants in Arriba and Seibert.

NEW HYDRO PLANT FOR SHENANDOAH RIVER.—The Shenandoah River Power Company, operating in the mid-valley section, from Mount Sidney to Strasburg, Va., is contemplating the development of another hydro project south of Shenandoah City. The projected dam will cross the Page-Rockingham County line, which runs through the river, and back up water for a mile or more. The company now operates four hydro-electric plants on the Shenandoah River and a steam plant at New Market. Its lines connect with those of the Page Power Company.

ILLINOIS POWER & LIGHT WILL CUT RATES BEGINNING NEXT NEW YEAR'S.—Following a 35 per cent reduction in electric light rates in the central Illinois territory in the last two years, the Illinois Power & Light Corporation has announced that, effective January 1, it will establish schedules affecting both domestic and commercial users and cutting a cent from the charge for the first block of power. The schedule will be 7 cents instead of 8 cents for the first block. The second block will be 6 cents and all over that 3 cents.

LOUISVILLE GAS & ELECTRIC GENERATING PLANT TO BE ENLARGED.—Announcement has just been made of plans for starting work immediately on additions to the Riverside steam plant of the Louisville Gas & Electric Company, the plans calling for additional boiler-room space and erection of another 250-ft. metal self-supporting smokestack. Two large boilers will be installed, making a total of twenty-four. The company plans to erect eventually another steam plant adjoining the hydro plant three miles down the river.

TELLURIDE POWER COMPANY WILL INTERCONNECT INSTEAD OF BUILDING.—The Telluride Power Company of Provo, Utah, has abandoned its idea of building an auxiliary plant in Sevier Valley. Instead, an agreement has been completed with the Utah Power & Light Company of Salt Lake City whereby a connecting link will be made at Santaquin to a trunk line leading to Gunnison. A 44,000-volt line will be built from Santaquin to Nephi. The line, after leaving Nephi Canyon, will be carried down through the valley of North Sanpete, then direct to Gunnison. Surveys will be started at once, and the line will probably be ready for connection this fall.

TRANSPORTING 30,000-KVA., 135-TON TRANSFORMERS. — Four 30,000-kva. transformers, weighing 135 tons each and standing 35 ft. high, are about to be shipped from the Westinghouse Electric & Manufacturing Company's plant at Sharon, Pa., to Roseland, near Newark, N. J., where they will be installed by the Public Service Electric & Gas Company to serve the northeastern end of the 220-kv. transmission system which interconnects the lines of that company with those of the Pennsylvania Power & Light and the Philadelphia Electric companies. Fifty-six cars will be necessary to make the shipment, of which four will be specially built to permit clearance under bridges. Temporary lowering of tracks at Cald-

Barcelona Exposition by Night

The spectacular lighting effects shown in this illustration were the work of engineers of the Westinghouse Electric & Manufacturing Company for the International Exposition in Barcelona, Spain.

well, N. J., has also proved necessary. These transformers—termed by the manufacturer the largest ever made—have been tested at 570 kv., said to be the highest voltage ever applied to a transformer.

UTICA (N. Y.) RATES TO BE LOWERED.—The Mayor and corporation counsel of Utica, N. Y., where much dissatisfaction with the electric rates of the Utica Gas & Electric Company has been manifested, recently conferred with Floyd L. Carlisle, chairman of the board of directors of the Niagara-Hudson Power Corporation, of which the Utica company is now a subsidiary, and were assured by him that a schedule of reduced rates will be drawn up. Mr. Carlisle is to go to Utica on July 30 to present the schedule at a public meeting.

DATE FIXED FOR UNITED STATES AND MEXICO TO TAKE UP RIVER PROBLEMS.—The International Water Commission will meet in Mexico City August 20. Important decisions are expected to grow out of this meeting. The one joint meeting of the commission and the separate meetings of the American and Mexican sections which have been held thus far dealt only with plans for gathering data. All necessary information is thought to be now in hand, and the full commission is in a position to discuss recommendations in connection with the international problems arising out of the use of the waters of the Colorado and the Rio Grande.

COMMITTEE CHAIRMEN FOR PUBLIC RELATIONS SECTION, N.E.L.A.—New chairmen of Public Relations National Section N.E.L.A. committees are announced as follows: Co-operation with educational institutions, John F. Gilchrist, Chicago; relations with financial institutions, C. B. Stuart, New York; women's committee, Miss Sara Harris, Utica, N. Y. W. H. Hodge, Chicago, remains as chairman of the committee on customer ownership; Homer E. Niesz, Chicago, as chairman of the industrial relations committee; T. A. Kenney, New York, as chairman of the committee on manufacturers' advertising, and W. S. Vivian as chairman of the public speaking committee.

NEW HYDRO PLANT FOR GRAYS HARBOR DISTRICT IN WEST WASHINGTON.—Workmen have begun to clear the dam site for the North River hydro-electric project to be developed in Pacific and Grays Harbor Counties, Wash., by the Western Washington Light & Power Company, a subsidiary of the Federal Light & Traction Company. The undertaking, which Sanderson & Porter are to construct, involves a generating plant, to cost $3,500,000, and a 66-kv. steel-tower transmission line from Aberdeen to Raymond, a distance of about 35 miles. The dam, 120 ft. high and 400 ft. long at the crest, will form a reservoir covering 7,600 acres. The power house will contain two 12,500-hp. turbo-generators with provision for a third of the same capacity when needed.

AGREEMENT REACHED OVER TABLE ROCK DAM.—A contract settling finally the differences which arose between the Empire District Electric Company and Stone County, Mo., concerning highways and bridges that will be affected by the company's construction of the Table Rock dam and power house near Branson, Mo., on the White River, has been signed at Galena, Mo. Approval of the plans by the Missouri Public Service Commission and the Federal Power Commission will, it is expected, be quickly followed by actual construction work. As previously reported in the ELECTRICAL WORLD, Table Rock Dam will be 1,924 ft. long and 197 ft. high. Four 28,000-hp. generators are to be eventually installed, and the cost will run high in the millions.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

Camp Co-operation IX—Association Island, Henderson Harbor, N. Y., Aug. 2-6. Society for Electrical Development, 600 Graybar Bldg., 420 Lexington Ave., New York.

International Association of Municipal Electricians—Statler Hotel, Boston, Aug. 20-24. H. N. Lang, box 1864, Orlando, Fla.

International Association of Electrical Inspectors, Western Section—Book-Cadillac Hotel, Detroit, Aug. 26-28. W. S. Boyd, 175 W. Jackson Blvd., Chicago. International convention, Vancouver, B. C., Canada, Sept. 9-11. F. D. Weber, P.O. box 745, Portland, Ore.

National Association of Railroad and Utilities Commissioners—Glacier National Park, Mont., Aug. 27-30. J. B. Walker, 270 Madison Ave., New York.

Rocky Mountain Division, N.E.L.A.—Hotel Colorado, Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

Colorado Utilities Association—Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

American Institute of Electrical Engineers—Pacific Coast convention, Santa Monica, Calif., Sept. 3-6. F. L. Hutchinson, 33 West 39th St., New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 4-6. H. A. Buch, Telegraph Building, Harrisburg, Pa.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 9-12. P. S. Millar, 80th St. and East End Ave., New York.

New England Division, N.E.L.A.—Hotel Griswold, New London, Conn., Sept. 9-12. Miss O. A. Bursiel, 20 Providence St., Boston.

Empire State Gas and Electric Association—Saranac Inn, Saranac Lake, N. Y., Sept. 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

American Electrochemical Society—Hotel William Penn, Pittsburgh, Sept. 19-21. C. G. Fink, Columbia University, New York.

Illuminating Engineering Society—Bellevue-Stratford, Philadelphia, Sept. 24-27. A. B. Oday, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A.—French Lick Springs, Ind., Sept. 26-28. T. C. Polk, room 110, 140 South Dearborn St., Chicago.

American Electric Railway Association—Atlantic City, Sept. 30-Oct. 4. J. W. Welsh, 292 Madison Ave., New York.

Association of Electragists International—New Ocean House, Swampscott, Mass., Sept. 30-Oct. 3. L. W. Davis, 420 Lexington Ave., New York.

National Safety Council—Stevens Hotel, Chicago, Sept. 30-Oct. 4. W. H. Cameron, 108 East Ohio St., Chicago.

National Electrical Manufacturers' Association—Wardman Park Hotel, Washington, Oct. 7-11. S. N. Clarkson, 420 Lexington Ave., New York.

REHEARING ON HOLSTON RIVER ASKED FROM TENNESSEE COMMISSION.—The East Tennessee Power Company has petitioned the Tennessee State Utilities Commission for another hearing on the award of certificates of necessity and convenience for power sites on the Holston River. As already reported, the commission awarded permits to the Holston River Power Company, subsidiary of the American Cyanamid Company. The petitioner contends that it is not legal for a public utility company to convey property to a company which is not a public utility. The American Cyanamid Company would develop the property under permits to its subsidiary.

ROCHESTER GAS & ELECTRIC TO BUILD TWO MORE DAMS ON UPPER GENESEE RIVER.—Plans for construction of two more low-head dams on the Genesee River as the aftermath of purchase of the Hooper water rights in the village of Belmont, N. Y., were announced last week by Thomas H. Yawger of the Rochester Gas & Electric Corporation. The dams will be built 12 miles apart, one at Geneseo and the other at York Mills. They will cost approximately $500,000 apiece, and construction is expected to begin within two years. Purchase of the Hooper rights brought virtually all the water rights of the Upper Genesee River into the possession of the Rochester Gas & Electric Company.

PORTLAND ELECTRIC POWER VALUATION.—Net additions made to the properties of the Portland (Ore.) Electric Power Company in the twelve-year period ending December 31, 1928, cost approximately $25,000,000 and have covered every department of the utility, according to a preliminary report filed by commission engineers now engaged in the determination of a new valuation of the holdings. "The records of additions and retirements from 1917 to 1928," reads the report, "as summarized in the valuation records of the power company, is more than 16,000 entries. But little, if any, less than a million items have been entered in the primary records in the twelve-year period." The commission is fixing the new valuation of the utility's holdings by adopting as a basis the valuation figures found by the department as of December 31, 1916, which amounted to $55,000,000.

Electricity a Commodity

Nebraska Supreme Court Denies that It Is a Service Affected with a Public Interest and Condemns Price Cutting by Company

HOLDING that electrical energy is a commodity and hence subject to the law that forbids persons engaged in the production, manufacture and distribution of commodities to intentionally (for the purpose of destroying the business of a competitor in any locality) discriminate between different sections, communities or cities by selling at a lower rate in one place than in another, the Nebraska Supreme Court has made perpetual the injunction issued by the District Court at Hartington restraining the Interstate Power Company from selling energy at a top price of 6 cents.

The court refused to accept the contention of the company that electrical energy is a service affected with a public interest, holding that, being produced, stored, measured, transported and bought and sold, it answers every definition of a commodity. From the record the court found that it was the settled and controlling policy of the company to preserve the monopoly it enjoyed at Hartington at all costs; that its efforts were carried even to the extent of adopting a policy of intimidation—diplomatic, but no less effective, forcible and efficient in accomplishing the desired object; that by a multiplicity of forms it sought to circumvent the commands of the statute, one entity establishing a 6-cent rate at Hartington and others maintaining elsewhere in Nebraska under like situation rates exceeding that at Hartington by 100 per cent; that the 6-cent rate is inadequate and non-compensatory to a degree that renders permanent competition on this basis wholly impossible and the ultimate destruction of its competitor at that point unavoidable; that the company pursued this course in a manner inhibited by the terms of the statutes and violative of the public policy of the state as expressed in the laws under the heading of "restraint in trade."

The court said that it did not overlook the contention that the 6-cent rate was insufficient to hold the patronage and hence not too low, but expressed the opinion that to expect that "the citizens of Hartington would continue for a substantial period of time to pay the 9-cent rate of the competitor when the same commodity was procurable at 6 cents is not in accord with the common experience of more than two centuries of competition."

The Hartington plant is one of 42 operated by the company in northeastern Nebraska. Its reduction from a top of 18 cents to 14 cents was not satisfactory to the citizens, and the Council gave a franchise containing a 9-cent rate to the Western States Utilities Company, which built a plant under a contract to turn it over to the city when the profits repaid the cost. The Interstate created a local subsidiary which, the court finds from the record, was organized as "a fighting company to get around the damned Nebraska anti-discrimination statutes."

Chief Justice Goss, joined by Justice Rose, has filed a dissent from the majority opinion. They agree that electricity is a commodity and its production, distribution and sale governed by the law preventing discrimination between localities, but they insist that the state utterly failed to prove that the 6-cent "fighting rate" offered by the Interstate is destroying or stifling the business of its competitor. They say they held that the case should have been reversed with permission to the state to renew the action later if conditions warrant.

Recent Court Decisions

TAKING RISKS KNOWINGLY PRECLUDES RECOVERY FOR INJURIES.—While declaring that an electric company, if reasonably chargeable with knowledge or in exercise of reasonable prudence bound to anticipate that persons may lawfully come within close proximity to its wires either for business or pleasure, must exercise care to keep the wires in a safe condition, the Supreme Court of Wisconsin ruled, in Ottman vs. Wisconsin-Michigan Power Company, that a painter climbing a ladder and attempting to pass between electric wires improperly insulated, knowing that it would be dangerous to come in contact with these wires, was guilty of contributory negligence precluding recovery for injuries resulting from contact with the wires. (225 N. W. 179.)*

STATE CANNOT RECOVER FOR FISH HATCHERIES WATER ASSIGNED TO POWER COMPANY.—No department of the State of Oregon can acquire legal right to the use of water after a public utility has built a plant and diverted such water to its own use for the purpose of developing electric power, in the opinion of the Supreme Court of the state. This decision was rendered in the case of State Fish Commission vs. People's West Coast Hydro-Electric Corporation, wherein the commission sought to deprive the utility of certain water-power rights in order to recover the use of the water for the development of fish hatcheries. The appellant instituted suit to cancel the utility's water privileges, contending that the electric company had relinquished its rights by altering the original source of the water supply it had appropriated through extending flumes and relocating equipment. The Supreme Court holds otherwise, asserting that an electric utility may make temporary use of water for power purposes until a plant or plants of greater capacity and of permanent construction may be completed and thereafter divert the water originally applied for to the use of these plants. In rendering its opinion the court reminds the appellant that testimony was introduced tending to prove that the utility, when first taking advantage of the water rights now being contested, built the necessary flumes and installed other hydro-electric equipment by transporting materials on the backs of men to a point on the side of a mountain where the temporary plant was first located. The fact that the utility later saw fit to change this almost inaccessible location of its plant, says the court, and elected to extend the flumes and rebuild the generating structure at a more convenient point, does not operate to relieve the operator of his water rights, nor did the act constitute abandonment of any authority granted by the state when the utility was given permission to use the water.

COMMISSION AUTHORITY UNNECESSARY TO CONDEMN PROPERTY IN TERRITORY ALREADY OCCUPIED BY UTILITY.—The Consolidated Gas, Electric Light & Power Company of Baltimore instituted proceedings to condemn an easement for a line of steel towers and electric wires over a strip of land owned by the Realty Improvement Company southwest of Baltimore. In sustaining the judgment for compensation, in a suit brought by the realty company against the power company, the Maryland Court of Appeals held that where the certificate of the Public Service Commission recited that the extension of the electric line was an extension within territory already served by the company, it was unnecessary for the Consolidated company to obtain the permission of the commission before bringing the condemnation proceedings and that it was unnecessary for the petition to allege public necessity.

Commission Rulings

MUNICIPALITY FORBIDDEN TO COMPETE WITH PRIVATE PLANT.—A determined attempt by the Borough of Brookville, Pa., to establish a municipal plant by purchase of one belonging to the Solar Electric Company having failed, the borough asked the Pennsylvania Public Service Commission to permit it to construct and operate a competing system. The Solar company, the borough maintained, had no vested rights, first, because it was only a dummy corporation, owned and controlled by a national holding company, a subterfuge to escape the regulatory powers of the commission, and, second, because it did not have municipal consent to the use of the streets. The commission denied the application, saying: "We find nothing in the facts of the present case sufficiently persuasive to constrain us to depart from the non-competitive policy hitherto employed in applications of this character. It is a policy that has proven itself economically sound and one which we would hesitate to abandon without compelling reasons therefor. Inadequacy of service or unreasonableness of rates are not alone sufficient, since we are empowered in such cases to apply corrective measures directly against offending public service companies in proper proceedings. We have, under proper circumstances, looked with favor upon municipal acquisition of utility plants operating within municipalities, and in fact have issued our certificate to the borough of Brookville for the acquisition of the plant of the Solar Electric Company. But we cannot see our way clear to approve an application such as this for the construction and operation of a municipal plant in direct competition with a company already occupying the field."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

Frank A. Leach Resigns Vice-Presidency of P. G. & E.

Frank A. Leach, Jr., for the past six years vice-president and general manager of the Pacific Gas & Electric Company, San Francisco, has resigned, effective July 31. Mr. Leach has a service record of thirty-one years with the company and has resigned in order "to play awhile," as he phrases it. In accepting his resignation the board of directors paid him the following tribute: "The services of Frank A. Leach, Jr., beginning with his employment as a junior clerk and continuing through the offices of assistant manager and manager of the East Bay district, assistant general manager, vice-president in charge of public relations and finally first vice-president and general manager, have been marked by constancy, loyalty and devotion and stand forth as an example and a model."

Mr. Leach became assistant general manager of the company in 1920, when he was transferred to San Francisco from the East Bay territory, where he had been division manager. A short time later he was appointed vice-president in charge of public relations and service, and in 1923, upon the death of John A. Britton, Mr. Leach was elected vice-president and general manager. Mr. Leach always has taken an active interest in the affairs of the electrical industry and served as president of the Pacific Coast Electrical Association during the 1924-25 administration.

E. P. DILLON has been appointed vice-president and associate engineer of the E. Y. Sayer Engineering Corporation, New York City. To his new position, one concerned with the design and construction of power and industrial plants for any purpose, Mr. Dillon brings an unusually diverse and comprehensive experience in both the technical and the commercial phases of engineering. Graduating from the Engineering School of the University of Colorado in 1899, he spent the next ten years in power-plant design and construction and in the operation and management of steam and hydro-electric power systems as well as gas plants. From these activities Mr. Dillon went to the Westinghouse Electric & Manufacturing Company in Pittsburgh and New York as assistant manager in charge of sales to power stations and substations for lighting, power and electric railway work. In 1918 he was made general manager for the Research Corporation of New York, in charge of sales of the Cottrell processes of electrical precipitation to the chemical, metallurgical, gas, electric and industrial fields.

Kelvin Medal Awarded to André Blondel

André Blondel of France is to be the recipient of the Kelvin medal for 1929. The medal is given for distinguished work in engineering. Mr. Blondel, as engineer of the Ponts et Chaussées department since 1889 and for many years the chief engineer of the French lighthouse service, is noted for his work on signaling apparatus and his investigations in connection with electrical measuring apparatus and photometry. In 1913 he became a member of l'Académie des Sciences and in 1923 was appointed inspector-general of bridges and highways. He is regarded as perhaps the most distinguished electrical engineer in France and is an honorary member of both the British Institution and the American Institute of Electrical Engineers.

This is the fourth triennial award of the Kelvin medal, previous holders being Dr. W. C. Unwin (Great Britain), Prof. Elihu Thomson (United States) and Sir Charles Parsons (Great Britain).

FRANK J. MILLER of Albany, Ore., has been appointed Public Service Commissioner to fill the vacancy created by the death of Commissioner Louis E. Bean. Mr. Miller is a recognized authority on regulatory affairs in Oregon, having gained a wide and comprehensive knowledge of utility matters by serving on the first public service commission organized in that state. He assumed his duties at once and at a conference of the members was elected chairman.

A. G. BUTLER, general superintendent of construction for the Louisville Gas & Electric Company, has been made manager of the Pittsburgh branch of the construction department of the Byllesby Engineering & Management Corporation and will leave for that city next week. G. R. ARMSTRONG has been promoted from assistant general superintendent of construction to succeed Mr. Butler. Mr. Armstrong, a graduate of Rose Polytechnic Institute, Terre Haute, Ind., has been with the Louisville company since 1922. Mr. Butler, also a graduate of Rose Polytechnic Institute, was put in charge of the construction department of the Louisville company in 1918. He was in direct charge of constructing the hydro-electric station at the Falls of the Ohio, a plant that attracted much favorable notice.

P. M. Downing Succeeds Leach in San Francisco

Paul M. Downing, vice-president of the Pacific Gas & Electric Company, San Francisco, in charge of electrical operation and construction, has been named first vice-president and general manager of the company to succeed Frank A. Leach, Jr., who has retired, effective July 31.

Mr. Downing's connection with the power company dates back to 1903, when he became superintendent of substations for the California Gas & Electric Corporation and operating engineer for that company and for the Pacific Gas & Electric Company, which later took it over. In succession he became division superintendent, operating engineer and engineer of operation and maintenance. The latter position he held for nine years until his appointment as chief engineer of the electrical department. In January, 1920, he was made vice-president of the company in charge of electrical operation, and soon thereafter the duties of supervision of electrical construction were added.

Mr. Downing is a pioneer in the electrical industry. He began his career as dynamo tender with the Tacoma (Wash.) Light & Power Company, was assistant motor inspector and powerhouse operator for the Market Street Railway Company, San Francisco, and in 1897 became station superintendent of the power house at Blue Lake City, Calif., one of the first hydro-electric plants in California. He later was associated with John Martin as agent for the Stanley Electrical Manufacturing Company, became chief electrician for the Standard Consolidated Mining Company, Bodie, Calif.; served as manager of the Colusa Gas & Electric Company, Colusa, and became division superintendent of the Bay Counties Power Company, San Francisco, in charge of transmission and distribution of power.

Mr. Downing has played a prominent rôle in the activities of the electrical industry and has just gone out of office as president of the Pacific Coast Electrical Association for the past year. He is a graduate of Stanford University, belonging to the pioneer class of 1895, of which President Hoover was a member.

H. R. L. EMMET, general manager of the Erie (Pa.) works of the General Electric Company, has been elected a director of the newly organized Lawrence Park National Bank in that city.

R. E. Dennis Receives Promotion in Mount Vernon

Robert E. Dennis, assistant chief electrical engineer of the Westchester Lighting Company, Mount Vernon, N. Y., since 1920, has been promoted to the position of chief electrical engineer. After being graduated from Union College in 1912, Mr. Dennis became affiliated with the General Electric Company as an electrical engineer. In November, 1914, he removed to Minnesota, as superintendent of the Kettle River Power Company, but about two years later returned East to take the position of electrical engineer in the commercial department of the General Electric Company's New York office. In May, 1920, he entered the employ of the Westchester Lighting Company. Mr. Dennis is a member of the National Electric Light Association and served for a year as chairman of the Metropolitan New York Section of that organization. He is also a member of the American Institute of Electrical Engineers and of the National Safety Council.

W. C. Lincoln, Chicago, has resigned as Western sales manager of the Electric Service Supplies Company, effective in the fall, to take up other activities.

Charles Piez, chairman of the board of the Link-Belt Company, Chicago, is the official nominee of the American Society of Mechanical Engineers for president of that organization next year. Paul Doty of St. Paul is among the nominees for vice-president and C. F. Hirshfeld of Detroit has been named as a director.

Harold S. Falk, vice-president and works manager of the Falk Corporation, Milwaukee, has been appointed chairman of the committee on industrial education of the National Metal Trades Association. Mr. Falk, who is much interested in this line of activity, is also a member of the committee on education and training for the industries of the American Society of Mechanical engineers.

Gerard Swope, president of the General Electric Company, has been elected a director of the National City Bank, New York, this being said to be the first occasion upon which Mr. Swope has associated himself as a director with an institution not connected with the electric light and power industry.

Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company, Baltimore, has been elected one of the members of the board of directors of the Chesapeake Club, a new business men's club in Baltimore.

Obituary

Samuel M. Kennedy

Samuel Macaw Kennedy, retired vice-president of the Southern California Edison Company in charge of business development and public relations, who gave up active work in 1927 because of ill health, died on Thursday morning, July 18, at his home in Alhambra, Calif. Funeral ceremonies were held at the Church of the Saviour, San Gabriel, on Saturday morning.

Mr. Kennedy achieved a national reputation in electrical circles because of his pioneer championship of the cause of good public relations and especially from the authorship of three publications written to serve this cause —"The Man in the Street," "Service" and "Winning the Public." The first two of these were in the form of essays and booklets. The third, published as a book in 1920, took rank at once, because of its comprehensive treatment of the subject and its direct and racy style, as a classic in its own line.

Mr. Kennedy was born in Toronto, Canada, in 1863, and was educated in the Dominion. On leaving college he became connected with a wholesale importing business of which his father was head, and for a time he was resident manager in London, England, making frequent trips to manufacturing centers in Europe. At the age of 31 his health broke down, and he removed to California, where it was restored through life in the open air. He became assistant to the president of the United Electric Power & Gas Company, Los Angeles, in 1900. This company was absorbed by the Southern California Edison Company in 1903, when Mr. Kennedy was made head of the commercial departments. In this post his original and progressive methods in commercial organization and business development not only contributed largely to the tremendous growth of the Southern California Edison but also did much to stimulate the development and earning power of the electrical industry on the Pacific Coast. In 1920 he was made a vice-president of the company.

Mr. Kennedy's major service, however, as already stated, was in practicing and preaching the promotion of good relations with customers and the public at large. His three principal ideas in this connection have been thus stated: First, to create a healthy demand for the service supplied; second, to popularize the service; third, to realize that the consumer is an individual who likes his individuality recognized. He contributed often to the Electrical World and other papers in impressing the last-mentioned point on the minds of the executives of the industry, besides publishing the book and essays already mentioned. One of his methods was the abolition of cashiers' cages and of private offices for his district managers, friendliness and informality being the foundation stones of his public relations policy.

Mr. Kennedy had the misfortune to break his hip and arm as the result of a fall about three and a half years ago, and he never completely recovered from the accident. Besides his connection with the Southern California Edison Company, he had been vice-president of the Santa Barbara Suburban Railway and the Pacific Gasoline Company and a director of the Alhambra Savings and Commercial Bank. He was a member of the American Institute of Electrical Engineers and the American Electrochemical Society and had been an active worker in the National Electric Light Association.

August Bartsch, one of the founders of the Paris (Ark.) light and power plant, died recently at his home in that city, following an illness of several years.

Thomas J. MacMillan, district superintendent of the Minnesota Power & Light Company at Sandstone, was, with a man helping him, electrocuted at Askov, Minn., on July 17 while removing the cover from a transformer.

Louis E. Bean, chairman of the Oregon Public Service Commission, died of heart failure at his home in Salem July 8. Mr. Bean was 60 years old and was appointed commissioner two years ago by Governor Patterson.

Sylvester M. Karicofe, founder and former president of the Quality Electric Works, the first electric motor works in the Southwest, died in Sierra Madre, Calif., July 8. Failing health caused him to retire from business a few years ago.

Elmer Themes, who was power supervisor for the Public Service Company of Northern Illinois when he retired from the service of that company in 1921, died in California on June 17. Mr. Themes joined the Northern Illinois company in 1891 as a streetlight trimmer and worked his way up through engineering and executive positions.

Max Gibson Newman, assistant to the head of the experimental division of the General Electric Company, Pittsfield, Mass., died there July 14 of heart trouble. Mr. Newman was born in Fryeburg, Me., in 1885 and was graduated from the University of Maine in 1907. He had been connected with the General Electric Company at Schenectady and Pittsfield for the past 20 years.

Financial and Statistical News

FIVE to ten point advances in utility stocks during single sessions are becoming more or less commonplace. Central States Electric probably made a record this week with a 122 point rise, taking its five Curb issues collectively, during a single session.

——THIS WEEK'S ANNOUNCEMENT OF ANOTHER MAMMOTH UTILITY TRUST emphasizes the increasing importance of the investment trust in the utility field. One of these utility trusts shows common stock appreciation exceeding $60,000,000 this year to date. Several have made a similar showing, at least on paper.

——FURTHER SPLITS IN SOME OF THE HIGHER-PRICED STOCKS are being discussed, and are strongly suggested by the advance of several issues over the 300 and even the 400 mark.

Power & Light Securities Issues Rights

The right to subscribe to additional shares of Power & Light securities trust at the rate of one share for each four held on July 22 has been offered to shareholders at $80 a share. The company's balance sheet as of June 30 showed 60,600 shares of beneficial interest and 80,001 warrants entitling holders to purchase at any time one share of beneficial interest at $75. The new offering will increase outstanding shares by probably 15,150, and by as many more shares as are necessary to take care of those shares issued prior to July 22 through the exercise of warrants.

California Commission Extends Time

An extension of time until July 1, 1930, has been granted by the California Railroad Commission to the Pacific Gas & Electric Company to issue and sell the unsold portion of an issue of 400,000 shares of 5½ per cent first preferred stock, of a total par value of $10,000,000. The company has advised the commission that 199,336 shares of this preferred stock, par value $4,983,400, is unsold, and that it will be unable to dispose of these shares at the price of $24.50 per share specified in the commission's previous order. The company's request for authority to dispose of the unsold shares at not less than $24 per share was granted by the commission.

New Hampshire Company Sells Issue

The Public Service Company of New Hampshire, with headquarters in Manchester, is in receipt of authority from the State Public Service Commission authorizing it to issue 10,000 shares of preferred stock of the $6 dividend series to be sold at not less than $93 a share. The proceeds, it is specified, are to be used for reimbursing the company for, or to pay indebtedness incurred by, additions and improvements within the state up to May 31 of this year.

There is also included in the disbursements, to be covered by the new stock issue, the requirement of 7 per cent bonds of the Manchester Traction, Light & Power Company to the amount of $4,000 and sinking fund bonds of the same company to the amount of $2,000.

Duke Power Stock Increase

A meeting of the stockholders of the Duke Power Company has been called for July 31 to authorize an increase in the capital stock from 1,000,000 shares to 1,500,000 shares. If stockholders approve this action the company plans to offer stock in the near future to stockholders to the extent of 10 per cent or 15 per cent of their holdings.

Dominion Power Profits Up

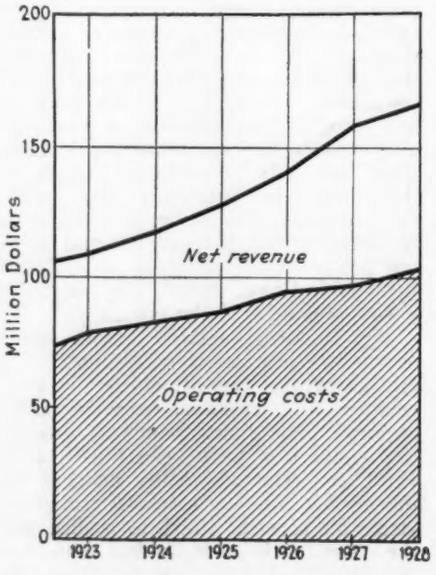
Net operating profits of the Dominion Power & Transmission Company for the first five months of the current year show an increase over those for the same period last year of 30 per cent. For each month this year to date earnings have shown a substantial gain over the corresponding 1928 figures.

Cities Service Net Earnings at New High Record

THE Cities Service System continues its high rate of growth with an increase of almost 16 per cent both in gross and in net earnings of the parent company for the twelve months ended June 30. Gross revenues of the entire system for the calendar year 1928 increased about 6 per cent over the previous year. Net earnings of the parent company for the past twelve months were the largest for any twelve-month period in the history of the organization, totaling $37,220,093.

Cities Service Company's net earnings for the twelve months ended June 30 were 6.43 times interest and discount charges on its debentures. The ratio of net earnings from stocks and reserves amounted to 4.64 times preferred stock dividend. This compares with 4.31 times for the corresponding period a year ago. Net earnings to common stock and reserves increased to $24,669,542, or $1.13 per share, on the average number of shares outstanding. This also shows a substantial increase over the previous year.

The Cities Service System has shown a steady growth both in size and in earning capacity over a long period of



Cities Service Shows Steady Upward Trend in Earnings

	Twelve Months Ended June 30, 1929	Twelve Months Ended June 30, 1928
Gross earnings	$38,422,711	$33,187,475
Expenses	1,202,618	1,125,104
Net earnings	$37,220,093	$32,062,371
Interest and discount on debentures	5,780,815	2,778,931
Net to stocks and reserves	$31,439,277	$29,283,439
Dividend preferred stock	6,769,734	6,796,184
Net to common stock and reserves	$24,669,542	$22,487,255

years. The company's assets, which at the end of 1928 amounted to $913,592,354, approximately doubled since 1923, while the earnings of the parent company more than doubled in the same period and the earnings of the operating companies increased by well over 50 per cent.

Apart from the oil interest of the company the public utility service of the system reached 900 communities in twenty states and some of the Canadian Provinces, with an aggregate population in excess of 4,000,000.

The earnings statement for the past two years ended June 30 is shown in the accompanying table.

New Capital Issues

Italian Superpower Corporation
6 per cent debentures, series A.
Amount, $4,000,000.
Price, $91 and accrued interest to yield about 6.65 per cent.
Feature, accompanied by common stock option warrants.
Due date, January, 1963.

Italian Superpower Corporation owns substantial minority interests in virtually all of the important electric power and light companies and in the principal telephone company in Italy.

Intercontinents Power Company
6 per cent debentures.
Amount, $3,000,000.
Price, $96 and accrued interest to yield 6.35 per cent.
Feature, with class A common stock purchase warrants attached—additional issue.
Due, 1948.

Intercontinents Power Company owns and is acquiring certain public utility properties in South America. The company is under the management of Gannett, Seelye & Fleming, Inc.

Standard Gas & Electric Issues Rights

Rights valued at $5,500,000 according to the present market quotations are being offered to common-share holders of the Standard Gas & Electric Company of record July 23. Shareholders are privileged to subscribe for additional common stock at $35 a share on the basis of one new share for each two held. The 141,895 additional shares to be sold at $85 each will give the company $12,061,075 of additional capital, assuming that all the shareholders take advantage of the right to subscribe.

Continued Activity in Light and Power

May Reports Show $165,600,000 Earnings, Increase 10.2 per Cent in Year—Output 7,715,587,000 Kw.-Hr.—Gains 15 per Cent—Hydro Breaks Records

UNCHECKED advances are shown in the reports for central-station operations in May received by the ELECTRICAL WORLD, which indicate a revenue of $165,600,000, operating expenses of $70,800,000 and an energy production of 7,715,587,000 kw.hr. Compared with corresponding months of 1928 there has been an acceleration; the revenue increase of 8.2 per cent in January has grown to 10.2 per cent in May, and the returns thus far in hand for June indicate no diminution in the movement; operating expenses have also increased, but in somewhat smaller ratio, so that the gain in net has been mounting; the energy output, growing faster than the revenue, exceeded that of May, 1928, by nearly 15 per cent.

Further, the seasonal decline is smaller than usual. The May revenue was only 1.5 per cent less than that for April; the output exceeded that of any other month except January, the culmination of the winter peak, and in terms of average daily kilowatt-hours barely missed the figure for April; in fact, January, February, April and May were nearly equal in this respect, as is evident from the chart. The energy curve is now far above the estimated normal.

STEAM OUTPUT GROWS 18 PER CENT IN YEAR

The output from water power, 3,397,735,000 kw.-hr., was the largest on record for any month, but the increase, though 10.9 per cent, was far from meeting the 1,003,000,000 kw.-hr. growth in total output; the 4,317,850,000 kw.-hr. required from fuel involved an increase of about 669,000,000 kw.-hr., or 18.3 per cent, over the output from this source in May of last year.

This remarkable rate of increase in fuel-generated energy has been going on for some time; during the first five months of the year the excess was more than 18 per cent compared with the corresponding period last year.

May Operations Much Exceeded Last Year's in all Sections of the Country

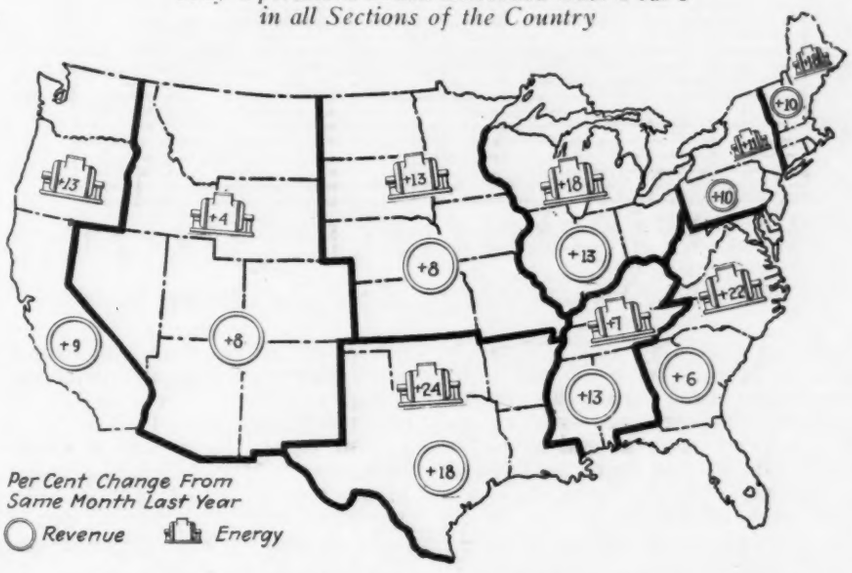


Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

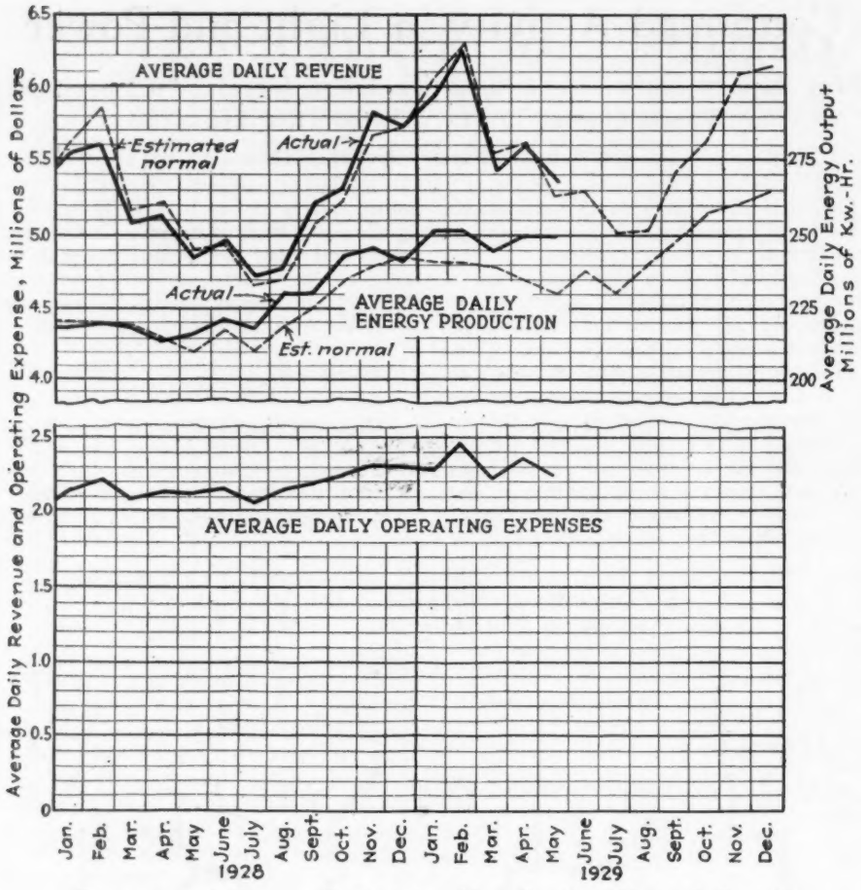
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1929 Thousands	1928 Thousands	Per Cent Inc.	1929 Thousands	1928 Thousands	Per Cent Inc.
February	$174,300	$161,300	+8.0	$69,100	$64,200	+7.5
March	167,700	155,700	+7.6	69,100	64,700	+6.8
April	167,900	153,200	+9.4	70,400	64,100	+9.9
May	165,600	150,300	+10.2	70,800	65,700	+8.0

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1929	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
February	3,381,668	+ 8.3	834,386	+60.0	7,164,889	+46.4
March	3,266,895	+ 4.7	707,446	+21.1	8,101,167	+44.6
April	3,134,897	+11.7	617,875	+21.9	7,800,352	+47.0
May	3,098,593	+ 9.8	573,734	+24.3	8,518,294	+48.6

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.



Revenue and Energy Output for May Surpass Normal Growth

The gain in May was achieved by burning 9.8 per cent more coal, which constitutes about nine-tenths of the total fuel, 24.3 per cent more oil and 48.6 per cent more natural gas. The actual amounts are stated in Table II.

Regional analysis shows the maximum rate of growth to be in the Southwest, as has been the case for many months. All the industrial areas gained notably, and even in the predominantly agricultural West North Central States there was a marked increase over May, 1928. The jump of 13 per cent in output in that section is unusual, although a similar rate was reported for April. On the Coast the seasonal variation differs from that in the rest of the country, the revenue being 7 per cent larger for May than for April. In that region, too, the need of recourse to steam is vividly evident from Table IV; thermal plants delivered more than twice as many kilowatt-hours during the month than they did a year before. The rate of increase was 130 per cent, while the limitations on the supply of water permitted only 2.2 per cent additional energy from hydro plants.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1929	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
February	7,046,042	+10.0	2,390,320	— 2.9	4,655,722	+18.1	1,200,000	0
March	7,606,649	+12.4	3,090,276	+12.8	4,516,373	+12.0	1,320,000	+5.0
April	7,506,845	+16.8	3,210,652	+13.4	4,296,193	+19.6	1,310,000	+7.5
May	7,715,587	+14.8	3,397,735	+10.6	4,317,850	+18.3	1,300,000	+3.3

Table IV—Regional Operations, Revenue and Energy Output in May, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	165,600	+10.2	7,715,587	+14.8	3,397,735	+10.6	4,317,850	+18.3
New England	15,850	+10.1	485,037	+18.0	251,058	+20.2	233,979	+15.5
Middle Atlantic	42,700	+ 9.5	1,753,460	+10.7	634,975	+11.0	1,172,485	+15.5
East North Central	42,800	+12.8	1,896,708	+17.9	269,304	+18.4	1,626,404	+17.7
West North Central	12,880	+ 7.9	440,847	+13.4	156,218	+ 5.4	284,629	+18.2
South Atlantic	17,400	+ 6.4	1,076,755	+21.9	683,613	+28.6	393,142	+11.5
East South Central	5,770	+12.7	285,690	+ 6.5	217,667	— 1.6	68,023	+44.7
West South Central	8,490	+18.0	385,684	+24.4	9,272	+91.0	376,412	+23.4
Mountain	4,090	+ 8.4	333,440	+ 4.4	297,345	+ 2.4	36,095	+24.3
Pacific	15,620	+ 8.6	1,058,966	+12.9	878,283	+ 2.2	180,683	+130.0

*As collected by U. S Geological Survey.

Capital Saving by Mergers

Discussing the capital benefits of mergers and consolidations, the current *Fortnightly Review* of G. M.-P. Murphy & Company says:

It must always be borne in mind that a public utility invests approximately $5 in plant and distributing facilities for each $1 it receives in annual gross. Obviously, a 1 per cent difference in the annual charge for capital makes a 5 per cent difference in the cost of the product. Once a utility has reached a size through natural growth or mergers where its security issues command national and even international attention, further growth may not make so important a difference in the cost of capital.

Referring to joint management of the gas and electrical industries the *Review* continues:

These two businesses practically do not compete with each other so that competition would not be lessened by merger. The economy of billing gas and electricity at the same time would alone save enough to permit an appreciable reduction in the customer's annual bill even if the company were allowed to retain part of the savings as additional profit.

Purposes of Voting Trusts

The functions of the voting trust in which shareholders of the Consolidated Gas, Electric Light & Power Company of Baltimore were recently invited to join are discussed by William J. Casey, president of the Continental Trust Company, in reply to an inquiry. Mr. Casey said: "With the further progress of the industry inter-relations between companies in the larger cities may prove to be of mutual advantage, but such advantage could be obtained by contract arrangements between operating companies without in any manner surrendering direct local control of operations.

"In the present area it has become possible for financial groups to acquire control in the management of a utility by buying up a minority interest of the stock, as against the unorganized majority of the stock, scattered as it is with the Baltimore company among some 15,000 stockholders, domiciled not only in different parts of this country but also abroad. A voting trust such as has been created for this situation, controlled directly by the management which built up the company to its present standards, is an effective safeguard against such exploitation."

Business News and Market Conditions

New Manufacturing Record in June

Both Small and Large Production Groups Show Big Advance Over This Time Last Year—Latter Still Show Increase

DURING June the electrical manufacturing plants of the country, as pictured by electrical energy consumption, continued the upward trend in rate of activity which started in February. June operations were of record proportions after adjustments are made for the number of working days. The rate of activity in June was 4.3 per cent over May, the previous record month, and 43.5 per cent over June last year. In 1928 a downward trend in activity started in May which was continued through August, but no such trend is visible during the same period this year.

June, 1929	170.5
May, 1929	163.5
April, 1929	154.6
March, 1929	148.3
June, 1928	118.9
Average first half 1929	153.3
Average first half 1928	121.5

A new record was also set for the first half of the year. The average rate of operations during the six-months period just closed was 26.2 per cent over the same period in 1928 and 32 per cent over 1927. The monthly rate of operations during the half was consistently above that of the same month last year, January reporting the smallest twelve-month increase, 5.3 per cent, and the June increase of 43.5 per cent being the highest.

The increased rate of activity in the electrical manufacturing industry during June as compared with May appears to have been due in large part to the continued high operations being maintained by the larger companies. The group as a whole reported an increased rate of operations during June of 14.3 per cent as compared with May and 51.4 per cent over June last year. The group of smaller manufacturers, on the other hand, reported a decreased rate of operations during June of 0.3 per cent as compared with May, but a 37.9 per cent increase as compared with June last year.

The index of activity in the electrical manufacturing industry, based on consumption of electrical energy, stands at 170.5 for June as compared with 118.9 in June last year. Comparative indexes of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are as shown in the accompanying table.

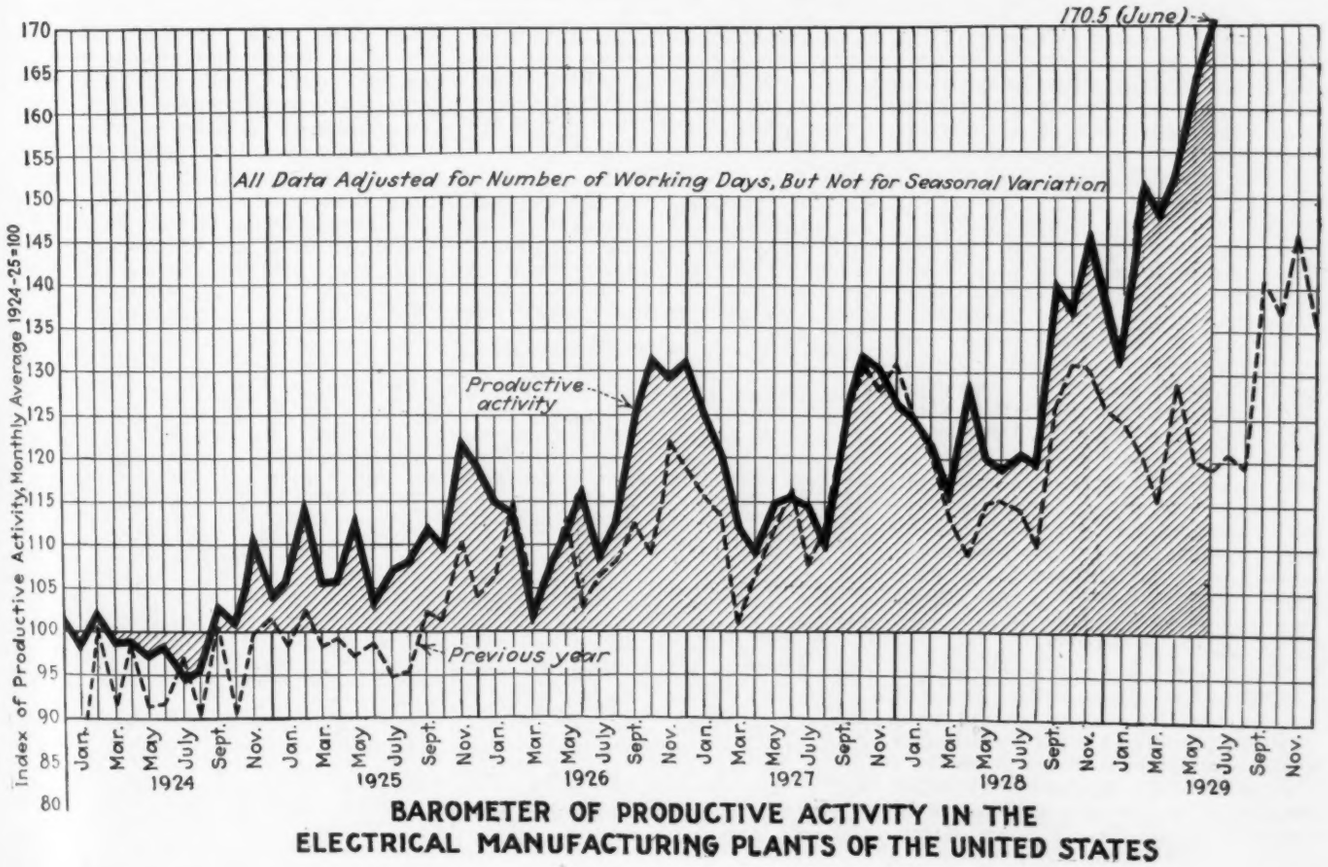
Fair demand for Metals; Little Change in Prices

The past week in the metal markets has been featureless. Demand for copper, lead and zinc has been about the same as it was a week before; that is, better than it was during most of the spring, but still not what one could call at all active. The strength in tin has continued, prices moving up above 47 cents. Other metals show little or no change quotationally. Most of the metal consumers continue to buy only for immediate requirements.

NEW YORK METAL MARKET PRICES

	July 17, 1929 Cents per Pound	July 24, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.75	6.75
Antimony	8.44	8⅛
Nickel, ingot	35	35
Zinc, spot	7.15	7.10
Tin, Straits	46.875	47.375
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price July 24, 1929, 19¾ cents.



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

Market Conditions

CURRENT and prospective railway equipment needs in connection with electrification projects create profitable business in Eastern district. Inquiries unusually heavy.

——NEW ENGLAND EQUIPMENT BUSINESS QUIET with small lots moving in most lines. Orders are small also in Southeast.

——NEW CONSTRUCTION WORK ACTIVE IN MIDDLE WEST. Line extension and circuit revision work under way. Control and switchboard equipment moving in small volume in St. Louis district.

——BIG EQUIPMENT, INCLUDING CIRCUIT BREAKERS AND TRANSFORMERS, moving satisfactorily on Pacific Coast. Activities on low scale in Puget Sound district.

EASTERN DISTRICT

With electric railway account assuming a prominent position in market activities in the Eastern district, central-station and industrial demands show marked tendencies toward uniformity, and there is little change in connection with the latter. The volume of business continues satisfactory and incoming inquiries are exceptionally good for this season of the year. The call for railway equipment, however, looms as a primary factor for record sales within the next few weeks, not only with regard to steam electrification programs but for industrial service. The Lehigh Valley Railroad Company has taken bids for apparatus for the electrification of its main line from Mauch Chunk to Wilkesbarre, Pa., about 75 miles, to cost $9,000,000. The New York Central Railroad Company is considering the electrification of its system from Croton to Buffalo. The Pennsylvania Railroad Company is proceeding with plans for its electrification program between New York and Philadelphia and is carrying out preliminary concrete construction and other work in the vicinity of Bristol, Pa., and Trenton, N. J.

A copper mining company at New York has given an order to a Pennsylvania manufacturer for two trolley type electric locomotives, each of 10 tons capacity, and for one storage battery type locomotive. Another metropolitan mining interest has contracted for four locomotives of the last noted type and another mining company, operating in Arizona, is expected to be in the market for equipment of this kind.

Power company transactions trend to substation apparatus and there is a firm, steady demand for transformers and accessories. A northern New York central station has given a commitment to a state manufacturer for transformers to an amount of $60,000. A Missouri utility company has contracted for similar equipment with an Eastern producer to cost $70,000. Another power company in Tennessee has purchased transformers and auxiliary apparatus to a sum of $30,000. In the line of prime movers, a Pennsylvania maker has secured a contract from a Texas central station for turbo-generators and accessories to cost $600,000. Another Texas power interest has placed an order with a Middle West manufacturer for a 20,000-hp. turbo-generator unit, with auxiliaries, while a New York producer has taken the contract for two 1,000-hp. boiler units. A manufacturer of motors and other industrial electrical equipment reports business as excellent in this line. A Connecticut manufacturer of clocks has placed an order for a quantity of disk motors to cost $25,000. A manufacturer of electric refrigerators reports peak conditions both with respect to demand and production, with no decline in sight. Construction projects are as follows:

The International Agricultural Corporation, New York, plans a commercial fertilizer plant at Texarkana, Ark., to cost $130,000. The Buffalo General Electric Company, Buffalo, N. Y., will build an addition to its Huntley steam-operated electric generating plant and will make extensions in transmission lines. W. P. Tanner, Gross & Company, New York, will build a flour storage and distributing plant at West New Brighton, S. I., to cost $270,000. The Otis Elevator Company, New York, will build a plant at Sydney, Australia, to cost $300,000. The Rubel Coal & Ice Corporation, Brooklyn, N. Y., plans additions to its cold storage and refrigerating plants to cost $4,000,000. The Cerro de Pasco Copper Corporation, New York, plans a power plant and extensions in the mining properties near Kingman, Ariz., to cost $10,000,000. The Trico Products Company, Buffalo, N. Y., plans an addition to its automobile accessories manufacturing plant to cost $70,000. The Delaware, Lackawanna & Western Railroad Company, New York, will build a coal storage and distributing plant at Brooklyn, to cost $100,000. The American Cirrus Engines, Inc., Belleville, N. J., plans a plant at Marysville, Mich., to cost $200,000. The Kensington Shipyard & Dry Dock Corporation, Philadelphia, will make expansions to cost $1,000,000. The American Sheet & Tinplate Company, Pittsburgh, will build an addition at Sharon, Pa., to cost $550,000. Frederick, Md., plans a floodlighting system and beacon lamps, at its proposed municipal airport. The Maryland Airport Corporation, Cumberland, Md., will install a floodlighting system and beacon lamps at its proposed airport to cost $100,000. The Bureau of Supplies and Accounts, Navy Department, Washington, is asking bids until Aug. 6 for insulated cable and wire for Eastern and Western Yards (Schedule 1402), and for electric cable and wire for same yards (Schedule 1432). The Bureau of Yards and Docks, Navy Department, Washington, is asking bids (no closing date stated) for refrigerator and machine for the navy yard at Parris Island, S. C. (Specification 5949). The Aviation Corporation of America plans the floodlighting of the airport recently acquired at Jamestown, N. Y. The Producers Warehouse & Elevator Company will install electrical equipment in the new concrete dryer house at Buffalo, N. Y., to cost $40,000. The U. S. Department of Commerce plans the floodlighting of the government landing field at Batavia, N. Y. The city of Franklin, Pa., will take bids for a new filter plant at its municipal waterworks. The National Analine Chemical Company, Buffalo, N. Y., plans an addition to its local plant to cost $30,000. The Continental Refining Company will install electrical machinery and equipment in its oil refinery at Oil City, Pa., to cost $200,000. The Rochester Telephone Company, Rochester, N. Y., has awarded a contract for a new exchange building at Fairport, N. Y. The Elspass Dehydrating Company, Rochester, N. Y., plans a modern plant at Albion, N. Y., to be electrically operated.

SOUTHEAST

Few individual orders of the moment were placed by central stations, though the general volume of business from this class of purchaser continues satisfactory in the Southeast. The largest order reported was for circuit breaker equipment amounting to $20,000, while some other central-station orders were for cable amounting to $6,000, pumping equipment totaling $4,600 and small switching equipment costing $4,500. One of the smaller power companies in Georgia ordered four cars of creosoted pine poles, while another company in the same state ordered similar material to the extent of three cars. The steel industry in the Birmingham section was responsible for an order for plating mill equipment amounting to $250,000, while the city of New Orleans ordered pumping equipment costing $60,000. A middle Georgia textile plant is letting contracts this week for electrification materials which will aggregate $20,000. Permits were issued in Atlanta covering the installation of thirteen passenger and four freight elevators in new or remodeled buildings, this elevator equipment totaling $161,500. Construction projects are as follows:

Fairmount, W. Va., plans a municipal fire alarm system. The Franklin Power & Light Company, Franklin, Tenn., plans an ornamental lighting system. Jackson, Tenn., is arranging a bond issue of $750,000, for a municipal light and power plant. The Knoxville Structural Steel Company, Knoxville, Tenn., plans a steel fabricating mill to cost $80,000. Nashville, Tenn., plans a floodlighting system and beacon lamps at its municipal airport to cost $200,000. The Southern Airways, Inc., Chapel Hill, N. C., plans beacon lamps on towers at its local airport. Columbia, S. C., plans a municipal fire alarm system, to cost $30,000. The Hardwood Dimension Company, Florence, S. C., Plans a mill to cost $100,000. The Sunniland Products Corporation, Jacksonville, Fla., plans a fruit canning plant to cost $70,000.

New England

Quiet conditions are reported in the New England district. Some activity is noted in the general scheduled supplies. Insulator sales are in small lots, but steady, while small switches and control orders are in fair demand and compare favorably with last year's movement at this time. Small motor sales are easing up and during the past week orders reached to $25,000. Fractional-horsepower motors are attracting attention and sales are indicating a gain over last year. Central-station replacement orders and new construction materials continue to be spotty. Some steel for outside structures was recently ordered for new additions to substations for outside control apparatus. Equipment for new building construction, particularly for commercial types, is rather active. Wire, cable and hardware are in good demand and poles, cross-arms and pole line hardware are moving steadily. Line extensions in eastern Massachusetts are reported progressing and good progress in range sales, refrigerators and appliances is noted. Construction projects are as follows:

A. G. Spaulding & Brother, Chicopee, Mass., will build an addition to its sporting goods plant, to cost $75,000. The Eastern Massachusetts Electric Company, Salem, Mass., plans a power plant to cost $120,000. The Scoville Manufacturing Company, Waterbury, Conn., plans an addition to its brass goods plant, to cost $70,000. C. H. Dexter & Sons, Inc., Windsor Locks, Conn., will build a paper mill, to cost $150,000.

St. Louis District

General business in the St. Louis district for the first three weeks in July has not been quite up to the June volume, but equals the same period of last year. There has been some activity in the mining territory. One mining company which recently bought a large turbo unit has ordered miscellaneous control equipment and a switchboard to cost $12,000 and a lot of mill motors to cost $11,000. Another company ordered three transformers, 667 kva., 13,000 volts each, costing $5,500. Construction projects are as follows:

Excelsior Springs, Mo., contemplates an ornamental lighting system. The Missouri Power & Light Company, Kansas City, Mo., plans extensions in its power plant at Jefferson City, Mo., to cost $50,000 and will build a transmission line between Jefferson City and Mexico, Mo., to cost $100,000. Springfield, Mo., plans a floodlighting system and beacon lamps to cost $35,000, at its municipal airport. The International Motor Truck Corporation, St. Louis, plans a service and repair building to cost $200,000. Harrison, Ark., plans a municipal electric light and power plant, to cost $50,000. Little Rock, Ark., plans a floodlighting system and beacon lamps at its proposed municipal airport to cost $200,000. Beaumont, Tex., plans a floodlighting system and beacon lamps at its municipal airport, to cost $100,000. The Phillips Petroleum Company, Bartlesville, Okla., plans an addition to the refining plant at Borger, Tex., to cost $200,000. The Central Power & Light Company, San Antonio, Tex., plans a transmission line near Del Rio, Tex., to cost $50,000. The West Texas Utilities Company, Abilene, Tex., plans a power plant of Lytle Lake, Tex., to cost $150,000. The Brown Paper Mill Company, Monroe, La., will build additions to its mill to cost $4,000,000.

Pacific Coast

Central-station business is very active in the San Francisco Bay district. A number of bids for equipment are being considered now and some will soon be opened. Prospects indicate the placing of a lot of good orders in the next few months.

Among the orders that were recently placed are one by the Pacific Gas & Electric Company for 34 oil circuit breakers amounting to $70,000 for use in San Francisco and one placed by the Great Western Power Company, Oakland, for three 667-kva. transformers worth $7,000. The demand for wire, conduit and wiring devices for buildings is at a low ebb in northern California but is better in the Los Angeles district, while the same supplies are in good demand by industrials at both ends of the state. There is considerable industrial activity at the present time, but the building trades are out of step. Business in pole-line hardware in general has been and still is keeping up. Orders for two carloads recently were placed and the prospects are good.

Buying was reported at a minimum, with but few scattered orders of small miscellaneous motors to lumber mills and allied industrials in the Puget Sound district. The only order of consequence was for 31 machines from 75 hp. down costing $8,000 and $10,000 worth of sawmill machinery to a lumber mill in Spokane, Wash. Central stations purchased a week's requirement of meters, small transformers and small motors. Within the next few weeks considerable activity is expected in hydro-electric apparatus when the city of Seattle calls for bids for approximately $1,000,000 worth of apparatus for two 60,000-kw. units at Diablo and the city of Centralia, Wash., lets contracts for about $100,000 worth of turbines, generating and transformers for its municipal plant. On August 5 the city of Tacoma, Wash., will open bids for $60,000 worth of disconnecting switches, lightning arresters, choke coils, etc., for Lake Cushman hydro-electric unit No. 2. Excellent range sales are reported all over the Puget Sound district. Construction projects are as follows:

The Holly Sugar Company, Denver, Colo., plans a sugar mill at Brawley, Calif., to cost $200,000. The Marchant Calculating Machine Company, Emeryville, Calif., plans an addition to cost $75,000. The Southern Pacific Railway Company, Los Angeles, will build a power plant and repair shops to cost $250,000. The Boeing Air Transport Company, San Francisco, plans an aircraft manufacturing plant at Oakland, Calif., to cost $350,000. The Pacific Coast Pulp & Paper Corporation, Richvale, Calif., plans mill units to cost $400,000. Santa Ana, San Mateo, San Diego, Gustine and Santa Rosa, Calif., plan ornamental lighting systems. Lewiston, Idaho, plans a floodlighting system and beacon lamps at its proposed municipal airport. The Bureau of Reclamation, Denver, Colo., will receive bids until Aug. 16 for radial gates and gate hoists for the Salt Lake Basin, Utah, and Minidoka, Idaho, projects (Specification 497). The Mine & Smelter Supply Company, Salt Lake City, Utah, will build a storage and distributing plant to cost $125,000. The Phoenix Aircraft Corporation, Phoenix, Ariz., plans a plant to cost $85,000.

Middle West

Present conditions in the Middle West indicate a continuance of general prosperity, although some lines of industry show some slight inactivity. General business fell off somewhat this week, running slightly below the same week last year. However, the month is expected to close well and compare favorably with the preceding months. The various utility companies are busy with a considerable amount of construction and a large amount of line extension and circuit revision work. Interesting orders placed include one for twenty electric trucks valued at $128,000, 25 16,000-amp., fourteen 3,000-amp. and eleven 4,000-amp. single-pole, single-throw solenoid-operated air circuit breakers and several construction orders aggregating $60,000. Jobbers' sales are normal. There has been an unusually large demand for vacuum cleaners. Construction projects are as follows:

The Giddings-Lewis Machine Tool Company, Fond du Lac, Wis., plans an addition to cost $100,000. LaCrosse, and Redgranite, Wis., plan ornamental lighting systems. The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., plans a mechanical and repair shop to cost $90,000. The University of Michigan, Ann Arbor, Mich., will make extensions in its lighting plant and system, including steam heating plant, to cost $400,000. The Detroit Aircraft Corporation, Detroit, will build a plant unit to cost $100,000. The Lake Superior District Power Company, Ashland, Wis., plans a transmission line near Ironwood, Mich. Cushman Brothers, Inc., Chicago, plans a baking plant to cost $250,000. The Electrical Research Laboratories, Chicago, will establish a radio equipment plant to cost $100,000. The International Molding Machine Company, Chicago, plans an addition to cost $85,000. The Indiana University, Bloomington, Ind., will soon take bids for a chemistry building to cost $350,000. Bellaire, Ohio, plans a municipal light and power plant to cost $500,000. The Franklin Steel Company, Cleveland, Ohio, plans an addition to cost $80,000. The Thompson Aeronautical Corporation, Cleveland, Ohio, plans an addition to its airport and plant to cost $150,000. The Hoover Company, North Canton, Ohio, will build an addition to its vacuum cleaner manufacturing plant to cost $100,000. Tippecanoe, Ohio, plans a call for bids for extensions and improvements in its electric light, power and water plants, to cost $100,000. The Jordan Electric Light & Heating Company, Jordan, Minn., plans extensions in its power plant, to cost $50,000. Lake Crystal, Minn., contemplates a municipal electric light and power plant, to cost $35,000.

Activities of the Trade

Westinghouse Orders Up 28.4 per Cent

The Westinghouse Electric & Manufacturing Company reports for six months ended June 30, 1929, a net profit of $13,131,881 after depreciation, interest and federal taxes, equivalent to $4.92 a share (par $50) earned on 2,666,315 shares of combined preferred and common stocks. This compares with $7,860,765, or $3.31 a share, on 2,370,063 combined shares in first half of 1928.

Net profit for the quarter ended June 30 amounted to $7,500,181 after above charges, equal to $2.81 a share on 2,666,315 combined shares against $5,631,700, or $2.11 a share, on 2,666,315 combined shares in preceding quarter and $3,902,411, or $1.64 a share, on 2,370,063 combined shares in the June quarter of the previous year.

Statement for six months ended June 30, 1929, compares as follows:

	1929	1928
Orders received	$121,184,546	$94,394,717
Sales billed	99,927,790	88,854,725
*Profit	13,382,864	8,619,411
Interest charges	251,483	758,656
Net profit	$13,131,881	$7,860,765

*After depreciation, taxes and reserves.

Statement for quarter ended June 30, 1929 compares as follows:

	1929	1928	1927
Orders received	$61,332,517	$46,547,240	$40,750,676
Sales billed	54,247,541	43,404,931	40,410,483
*Profit	7,500,806	4,282,480	3,132,864
Interest charges	1,125	380,069	376,850
Net profit	$7,499,681	$3,902,411	$2,756,014

*After depreciation, taxes and reserves.

Beardslee and Williamson Companies Combine

An announcement has been made by the Beardslee Chandelier Manufacturing Company and R. Williamson & Company, Chicago, of the consolidation uniting the interests of these two nationally known manufacturers of lighting equipment. The organization will hereafter be known as the Beardslee Chandelier Manufacturing Company. They will continue to manufacture the distinctive and exclusive designs of lighting equipment for shaded light developed by R. Williamson & Company, as well as the complete lines of the Beardslee Chandelier Manufacturing Company.

THE SUNDH ELECTRIC COMPANY, INC., Newark, N. J., manufacturer of electric control apparatus, announces that E. H. Bollenbacher, formerly with McClellan & Junkersfeld, Inc., New York, has been appointed as its representative in the states of Georgia, Florida and South Carolina with headquarters at 805 Forsyth Building, Atlanta, Ga. J. W. Eshelman, who formerly handled this territory will remain in Birmingham, but will cover Alabama only.

Policy in Accordance with Safety Recommendations

The Bull Dog Electric Products Company, Detroit, announces to the electrical industry and the general public the following policy in relation to the manufacture of its products:

"Effective at once, we, as leading manufacturers of products for electrical distribution and control, shall discontinue advertising, offering for sale and manufacturing all live-face electric products not recognized and approved by the safety recommendations and rules as published by the Department of Commerce, U. S. Bureau of Standards, in accordance with the procedure of the American Engineering Standards Committee.

"In line with this policy, we will no longer manufacture the following:

1. Live-face or open type lighting panelboards.
2. Lighting panelboards having main fuses (not switched) or fusible only sub-feeds on the panels.
3. Feeder or distributing panelboards having fuses only in the branches (not switched).

"As heretofore, we shall continue to devote our entire energies and resources to the increased use of electricity through promotion of safety electrical products for the protection of life and property."

THE LOCKE INSULATOR CORPORATION, Baltimore, Md., announces the appointment of C. W. Roberts as its district manager for New England with offices at 201 Devonshire Street, Boston. The company also announces that C. H. Wheeler, formerly district manager for its New York territory, and A. M. Jackson, formerly district manager of its Chicago territory, have been appointed commercial vice-presidents.

THE RAINBOW LUMINOUS PRODUCTS, INC., 120 Broadway, New York City, manufacturer of luminous tube-lighting apparatus, has acquired the electric and commercial sign division of the Central Outdoor Advertising Company. This new unit operates in Cleveland and the surrounding territory.

THE ROBBINS & MYERS, INC., Springfield, Ohio, manufacturer of electric motors, generators and fans, announces that W. W. Mumma has resigned as fan sales manager of its company. Mr. Mumma's duties will be taken over by C. H. Clark, merchandising manager of the company.

General Electric Sales Up 23 per Cent

Sales billed for the first six months of 1929 by the General Electric Company amounted to $194,353,307, according to Gerard Swope, president of the company. This compares with $158,015,221 for the corresponding period of last year, an increase of 23 per cent. Profit available for dividends on common stock for the first six months of 1929 was $30,740,768 compared with $24,388,002 for the same six months of last year.

A comparative statement of sales and earnings for the six months is given in the accompanying table.

	1929	1928
Net sales billed	$194,353,307	$158,015,221
Less: Cost of sales billed, including operating, maintenance and depreciation charges, reserves and provision for all taxes	170,104,501	138,889,039
Net income from sales	$24,248,806	$19,126,182
Other income, less interest paid and sundry charges	7,779,347	6,549,125
Profit available for dividends	$32,028,154	$25,675,307
Less: Cash dividends on special stock	1,287,386	1,287,304
Profit available for dividends on common stock	$30,740,768	$24,388,002

The profit available for common stock for the six months is equivalent to $4.26 in 1929 and $3.38 per share in 1928 on the 7,211,481 shares outstanding.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received an order from the Youngstown Sheet & Tube Company for motors and control for use in driving a 10-in. and a 14-in.-18-in. merchant mill to be installed in the Indiana Harbor works of the company. The company also has secured a contract from the West Leechburg Steel Company, Leechburg, Pa., for a complete electric drive for a new 12-in. hot strip mill to be installed to replace an old Belgian type mill. It comprises a 1,600-hp. alternating-current motor, eight direct-current motors totaling 4,300 hp. and 3,000 kw. in generating equipment. Included in the contract are the necessary speed reduction units which will be made at the Nuttall Works of the Westinghouse company. The contract also includes a 2,200-hp. alternating-current motor required for a rearrangement of the drives of the present 16-in. mill and a 1,000 kw. motor-generator for supplying direct current to auxiliary mill motors.

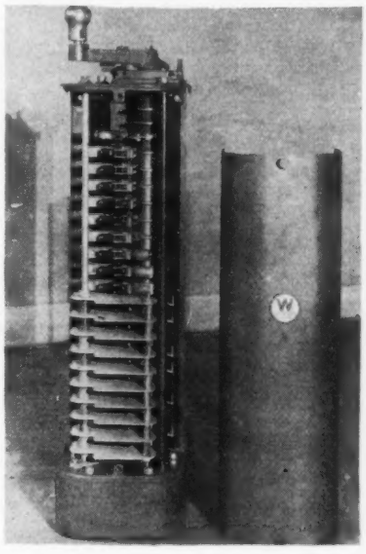
THE GENERAL ELECTRIC COMPANY has received an order from the United States Department of Commerce for 400 airway beacons to be installed on additional airway routes. The company also will furnish motors with control for electric braking on fifteen trolley buses to be placed in service by the Utah Light & Traction Company.

New Equipment Available

Reversing Drum Controller

A new line of reversing drum controllers is announced by the Westinghouse Electric & Manufacturing Company under the trade name type A controller and listed in classes 8,300 and 8,400 for d.c. service and in classes 12-700 and 12-800 for a.c. service. These controllers are designed for heavy usage in operating cranes, hoists, bending rolls, railway turntables and the like. They incorporate many new features and refinements in design and operation.

The drum cylinder consists of rolled



brass supporting disks assembled on a micarta insulated steel shaft between brass and micarta insulating collars. The contact segments are bolted to the supporting disks in such a way as to eliminate burning of the bolt heads. The segments are reversible, which doubles their operating life. Burned ends may be trimmed down to form shorter segments, thus reducing the stock of renewal parts necessary.

Fingers are of the compensating self-aligning type, which assures square alignment on the contact segments. An adjustment is provided to compensate for finger wear, while localized heating of the joint is prevented by collar shunts direct from the terminal to the finger tips.

Welding Electrode Holder

As a supplement to its line of electric arc-welding equipment the General Electric Company announces a clamp type electrode holder. This device has jaws of heavy copper alloy notched to hold firmly any size of electrode wire from $\frac{1}{16}$ to $\frac{1}{4}$ in. in diameter in any position.

A molded compound handle protects the operator from heat and contact with current-carrying parts. The holder is designed for use with current up to 300 amp. It may be obtained, if desired, assembled with 5 ft. of extra flexible cable and terminal.

Dubilier Dry "A" Condenser

For applications requiring high capacity at low voltage the Dubilier Condenser Corporation, New York City, has developed a dry "A" condenser. This unit is in the form of the polarized condenser utilizing a novel bone-dry electrochemical dielectric.

The Dubilier dry "A" condenser is intended for use on unidirectional or direct current up to 15 volts where high capacity is essential. The main applications are for "A" battery eliminators, for low-voltage rectifier circuits supplying radio or signal systems and for hum-proof operation of dynamic speakers on rectified field current. Its leakage current is stated to be less than 1 milliampere.

Rubber-Mounted Motors Newly Designed

A new motor, under the trade name RAR, developed especially for applications requiring ultra-quiet performance, is announced by the Wagner Electric Corporation, St. Louis, Mo. It is completely insulated from the supporting cradle-shaped base by means of rubber bushings, effecting, it is claimed, an exceptionally quiet motor, ideally suited to the needs of homes, schools, churches and any other places where motor noise is objectionable. Notwithstanding the use of rubber to absorb the minimum amount of vibration produced in the motor, the entire outfit is practically rigid and the shaft alignment is in no way endangered. The new type of mounting has been effected without a change in over-all length and width dimensions.

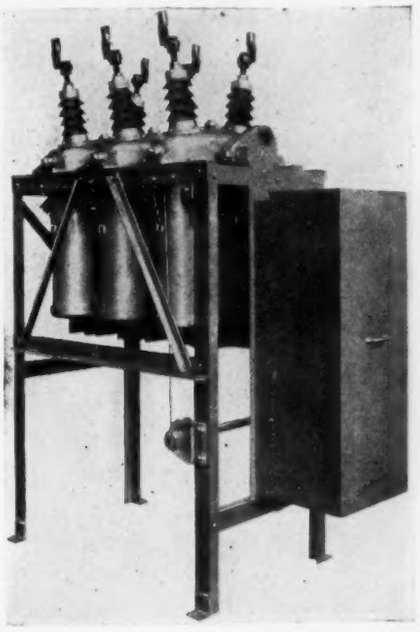
The motor is of the brush-lifting type, the brushes being lifted off the commutator as soon as the rotor attains operating speed. This feature insures quietness in operation and prolongs the life of commutator and brushes.

The motor proper has also undergone important alterations further to improve quietness and electrical performance. In addition to equipping governor weights with rubber bumpers, as was done previously, the rocker arm has been redesigned practically to eliminate brush noise during starting and stopping. The power factor and efficiency, it is claimed, are considerably better than the N.E.M.A. requirements due to the distribution of material.

Moderate Capacity Oil Circuit Breaker

A new outdoor oil circuit breaker of moderate interrupting capacity, known as the type O-2, for outdoor distribution services at 15,000, 25,000 and 37,000 volts is announced by the Condit Electrical Manufacturing Corporation of Boston. The type O-2 oil circuit breaker is of sturdy, weatherproof construction throughout. Pole tops are fabricated of hot rolled steel plate and angles and are of novel design, affording a rigid foundation for the bushings and mechanism.

The design of the operating mechanism embodies the highly important



features of easy inclosure and, at the same time, affords ample pressure at the contact surfaces. A novel feature is the ability to locate the breaker control mechanism, such as hand-operated face plate solenoid or motor mechanism, in any one of six positions. The mechanism as a whole is designed to secure that acceleration of the movable contact member during the opening of the circuit which has proved to be the most efficient in circuit interruption. Large, one-piece solid porcelain type bushings of high mechanical and electrical strength extending below the oil line and securely clamped at the pole top with water-tight gaskets provide more than ample insulation. Provision is made for two bushing-type current transformers per pole. Series type current transformers mounted within the breaker tank may also be supplied if required. The pole units are mounted on a supporting framework of angle iron. The type O-2 oil circuit breakers are furnished for 400, 600 and 800 amp. The estimated interrupting capacity at the different voltages is as follows: 15,000 volts, 200,000 kva.; 25,000 volts, 150,000 kva.; 37,000 volts, 100,000 kva.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 9, 1929)

1,720,586. Oil-Immersed Electric Switch Gear; A. Allan, Tynemouth, and H. W. Clothier, Wallsend-on-Tyne, England. App. filed Feb. 25, 1928.

1,720,605. Terminal for Conductor Wires; D. I. Marshall, New London, Iowa. App. filed July 12, 1927.

1,720,613. Time-Element Device and Motor-Control System Employing the Same; G. B. Starie, Schenectady, N. Y. App. filed May 4, 1925.

1,720,619. Swivel for Light and Drop Cords and the Like; E. W. Baldwin, Nampa, Idaho. App. filed April 2, 1926.

1,720,623 and 1,720,624. Motor Control and System; E. R. Carichoff and B. W. Jones, Schenectady, N. Y. Apps. filed Jan. 26, 1920, and May 4, 1925.

1,720,627. Electric Switch; C. S. Cross, Brooklyn, N. Y. App. filed Dec. 18, 1924.

(Issued July 16, 1929)

1,720,659. Method for Determining Electrical Axes in Crystals; E. Giebe and A. Scheibe, Charlottenburg, Berlin, Germany. App. filed April 21, 1927.

1,720,662. Electric Welding; T. F. Burke, Brooklyn, N. Y. App. filed Jan. 20, 1926.

1,720,664. Electric Welding Apparatus; A. Churchward, New York, N. Y. App. filed Nov. 8, 1926.

1,720,685. Clock-Setting Mechanism; J. O. Nelson, Topeka, Kan. App. filed Nov. 18, 1926.

1,720,706. Meter Switch; H. D. Winton, Wellesley, Mass. App. filed May 21, 1925.

1,720,731. Dynamo-Electric Machine; T. S. Jones, Newport, England. App. filed April 7, 1928.

1,720,738. Signaling System; A. Le Boutillier, Western Springs, Ill. App. filed Dec. 16, 1926.

1,720,749. Insulating Material; G. L. Schnable, Riverside, Ill. App. filed June 27, 1925.

1,720,775. Apparatus for Singeing Hair; L. T. Welden, Bethany, Mo. App. filed June 14, 1928.

1,720,793. Heat-Operated Alarm; F. A. Kunkle, Slatington, Pa. App. filed March 5, 1928.

1,720,808. Primary Cell; D. O. Walden, Fremont, Ohio. App. filed June 16, 1925.

1,720,818. Switch Lock; C. Christensen, Chicago, Ill. App. filed Aug. 8, 1923.

1,720,837. Thermostat; L. P. Hynes and H. A. Williams, Albany, N. Y. App. filed May 20, 1926.

1,720,844. Oil Switch; A. F. Lotz, Chicago, Ill. App. filed Jan. 4, 1924.

1,720,854. Electromagnetic Hammer; B. H. Parker and C. D. Beeth, Jr., Lamar, Colo. App. filed Aug. 22, 1927.

1,720,860. Electrical Switch; R. L. Smythe, Milwaukee, Wis. App. filed Aug. 19, 1927.

1,720,865. Apparatus and Articles for Waving Hair; G. R. Thompson, New York, N. Y. App. filed Feb. 20, 1924.

1,720,896. Slow-Acting Circuit Controller; F. W. Haderman, Los Angeles, Calif. App. filed Sept. 12, 1927.

1,720,901. Regulating Apparatus; E. A. Ileman, New York, N. Y. App. filed Sept. 18, 1926.

1,720,910. Process of Treating Material in Liquid State Electro-chemically; C. Longhi, Milan, Italy. App. filed Dec. 12, 1924.

1,720,943. Electromagnetic Device; E. Chapman, Cleveland, Ohio. App. filed July 2, 1927.

1,720,957. Storage Battery; J. C. Holden and C. Colliflower, Terre Haute, Ind. App. filed Jan. 14, 1928.

1,720,995 and 1,720,996. Electrolytic Cell; F. H. Buck and P. McRae, Wilmington, Del. Apps. filed Dec. 5, 1925.

1,721,008. Timer for Internal-Combustion Engines; J. Drahonovosky, Milwaukee, Wis. App. filed June 22, 1923.

1,721,012. Thermostat; J. J. Fagan, Bayonne, N. J. App. filed Jan. 3, 1928.

1,721,018. Means for Cable-Sheath Bonding; H. Halperin and K. W. Miller, Chicago, Ill. App. filed Oct. 6, 1927.

1,721,023. Magnet; P. L. Jensen, Alameda, Calif. App. filed Oct. 26, 1927.

1,721,069 and 1,721,070. Knee Control Mechanism for Portable Electric Sewing Machines; D. H. Chason, Elizabeth, N. J. Apps. filed June 9, 1928.

1,721,073. High-Frequency Induction Furnace; W. Esmarch, Berlin-Halensee, Germany. App. filed Oct. 12, 1927.

1,721,079. Means for Starting the Motors of Multimotor Drives; G. E. Grau, Berlin-Charlottenburg, Germany. App. filed Dec. 30, 1926.

1,721,081. Regulating Device for Arc Lamps; F. Meyer, Jena, Germany. App. filed June 21, 1928.

1,721,098. Fuse Block and Plug Therefor; C. W. Wallis, Toronto, Ont., Can. App. filed March 28, 1927.

1,721,099. Electric Strip Heater; E. L. Wiegand, Dormont, Pa. App. filed July 31, 1925.

1,721,116. Electrical-Plate Unit; C. A. Henry, Dayton, Ohio. App. filed March 31, 1927.

1,721,119. Conduit Clamp for Knock-Out Boxes; N. O. Houghton, Washington, D. C. App. filed Oct. 30, 1926.

1,721,152. Electrical Condenser; W. A. Graham, Brooklyn, N. Y. App. filed Dec. 2, 1920.

1,721,163. Control for Electric Circuits; G. Muffly, Detroit, Mich. App. filed Nov. 5, 1926.

1,721,177. Electromagnetic Relay; W. B. Churcher, Cleveland, Ohio. App. filed Jan. 29, 1926.

1,721,191. Electric Range; A. T. Smith, Waterbury, Conn. App. filed Sept. 13, 1926.

1,721,203. Pocket Electric Gigarette and Cigar Lighting Machine; H. Bucknell, Jr., Selden Chapin and C. A. McKelvey, Peking, China. App. filed July 23, 1927.

1,721,207. Attachment-Plug-Cap Snubber; R. H. Cunningham, Jackson, Mich. App. filed Feb. 3, 1928.

1,721,218. Multiple-Conductor Aerial Cable; S. B. Hood, Minneapolis, Minn. App. filed Dec. 24, 1925.

1,721,222. Switch-Operating Mechanism; M. Kaminsky, New Britain, Conn. App. filed Feb. 28, 1928.

1,721,259. Strain Insulator; W. H. Pearl, Indianapolis, Ind. App. filed Aug. 6, 1924.

1,721,263. Method and Apparatus for Riveting; S. F. Tapman, Jamaica, N. Y. App. filed Aug. 20, 1927.

1,721,286. Traffic-Control Apparatus; E. C. Sweetman, Toledo, Ohio. App. filed Feb. 4, 1927.

1,721,292. Combination Resistance and Reflector Units; O. C. Britsch, Woodhaven, N. Y. App. filed April 23, 1926.

1,721,295. Electrical Insulation; W. F. Doerflinger, West New Brighton, N. Y. App. filed June 22, 1928.

1,721,296. Welding Electrode Holder; R. B. Fehr, East Cleveland, Ohio. App. filed Dec. 1, 1925.

1,721,303. Method of Removing the Sprues from Cutting Tools and Similar Objects; E. Jacob, Dusseldorf, Germany. App. filed April 16, 1928.

1,721,348. Means for the Generation of Electric Current for Electric Welding; J. H. St. Hill Mawdsley, Barnwood, near Gloucester, England. App. filed Aug. 20, 1928.

1,721,350. Continuous Annealing Apparatus; H. M. Naugle and A. J. Townsend, Canton, Ohio. App. filed Nov. 17, 1924.

1,721,365. Electric-Lamp Socket; E. W. Zwetsch, Alexander, N. Y. App. filed March 23, 1928.

1,721,374. Apparatus for Testing Insulating Liquids; C. Dantsizen, Schenectady, N. Y. App. filed March 29, 1926.

1,721,375. Meter-Testing Apparatus; T. de Koning, Brooklyn, N. Y. App. filed Nov. 3, 1925.

1,721,383. Metal Composition; G. R. Fonda, Schenectady, N. Y. App. filed May 1, 1923.

1,721,384. Electric Lamp; G. R. Fonda, Schenectady, N. Y. App. filed May 31, 1928.

1,721,407. Filter-Press Electrolyzer; R. Pechkranz, Geneva, Switzerland. App. filed July 10, 1925.

1,721,409. Protective Arrangement; R. Pohl, Berlin, Germany. App. filed Aug. 31, 1927.

1,721,410. Control System; D. C. Prince, Schenectady, N. Y. App. filed Dec. 18, 1925.

1,721,414. Process and Apparatus for Recutting or Sharpening All Tools Having Numerous Fine Cutting Edges; W. B. Robe, Towson, Md. App. filed Aug. 2, 1927.

1,721,417. Electric Switch-Operating Mechanism; C. F. Schwennker, Schenectady, N. Y. App. filed July 19, 1928.

New Trade Literature

CONTROLLERS AND PUSH BUTTONS.—The Clark Controller Company, Cleveland, is distributing bulletins No. 114 and No. 110-B describing and illustrating respectively its vari-time magnetic controllers and the Clark "Three C" push buttons.

STARTERS, GENERATORS, ETC.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued the following. Leaflet L.1661-D describes the new classes 13-125 and 13-225 magnetic starters for wound rotor induction motors; leaflet L.20,406 describes the class 11-400 magnetic resistance type starter for squirrel-cage induction motors; leaflet L.20,414 covers the type QS engine-driven direct-current generators and leaflet L.20,287-A explains the Sharples oil reclaiming process for circuit-breaker oils and describes and illustrates the apparatus used in the process.

AIR COMPRESSORS AND VACUUM PUMPS.—Bulletin No. 147 issued by the Pennsylvania Pump & Compressor Company, Easton, Pa., describes the Pennsylvania air-cushioned valve air compressors and dry vacuum pumps, of the straight-line, single-stage, double-acting types. A cross-sectional view of the compressor, together with descriptions and illustrations of Pennsylvania methods of compressor regulation, also is included.

LIBRARY LIGHTING.—The Holophane Company, Inc., 342 Madison Avenue, New York City, has issued booklet No. 1,000, entitled "Light for Library Bookstacks," which covers the method of lighting library bookstacks. It contains illustrations of various types of Holophane specifics that have special application to library lighting problems and a list of the proper lighting devices for each library location is given.

LAMP GUARDS, CABLE CLAMPS, ETC.—The W. N. Matthews Corporation, 3722 Forest Park Boulevard, St. Louis, has issued several new price sheets covering the Matthews holdfast lamp guards, holdfast portables and lamp changers, cable clamps, cable splicing joints, "Scrulix" anchors, slack pullers, adjustable reel, its type C-W teleheight, type L telefault, "Xpandix" anchors and its "Traplox" anchors.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A sole agency is desired in Buenos Aires, Argentina (No. 39,663), for electrical conduits.

An agency is desired in São Paulo, Brazil (No. 39,614), for household electrical appliances and motors, wiring supplies and rigid and flexible conduits.

Purchase and agency are desired in Glasgow, Scotland (No. 39,777), for household heating and cooking devices and electrical refrigerators.

Purchase is desired in Bautzen, Germany (No. 39,778), of railway car lighting equipment.

An agency is desired in Winnipeg, Canada (No. 39,615), for electrical machinery and equipment for mines or power plants.

Purchase or agency is desired in Toronto, Canada (No. 39,729), for electrically or mechanically operated physical-culture machines.

Purchase is desired in Singapore, Straits Settlements (No. 39,672), of hotel electric refrigerators.

An agency is desired in Nantes, France (No. 39,613), for vacuum cleaners.

An agency is desired in Montreal, Canada (No. 39,616), for electric vibrators.

Purchase and agency are desired in Poznan, Poland (No. 39,612), for insulated wire and cable.

Purchase is desired in Guaymas, Mexico (No. 39,779), of X-ray equipment.